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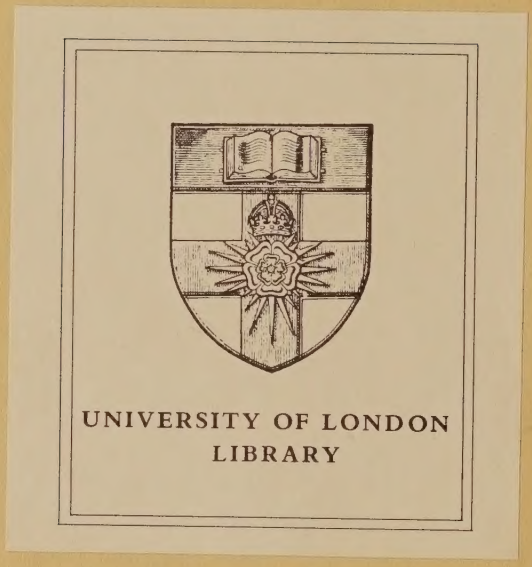

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FROM

COMMISSIONERS, INSPECTORS,

AND OTHERS:

FORTY-SEVEN VOLUMES.

—(21.)—

EDUCATION (SCIENCE AND ART DIRECTORY);
DUBLIN HOSPITALS;
METEOROLOGY;
NATIONAL GALLERY; NATIONAL PORTRAIT GALLERY;
PATENT OFFICE;
WEIGHTS AND MEASURES.

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1895.

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DEPARTMENT OF SCIENCE AND ART
OF THE COMMITTEE OF COUNCIL ON EDUCATION,
LONDON, S.W.

DIRECTORY,

(*Revised to June* 1895.)

WITH

REGULATIONS

FOR

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Special and Technical Assistants.—A. Reid W. G. Johnson; W. T. Key; W. J. Hill; F. P. Macaulife; F. G. M. Beaumont; C. Stanley Clarke; E. R. J. Williams.

GEOLOGICAL SURVEY.

Director-General.—Sir Archibald Geikie, D.Sc., LL.D., F.R.S.

Director for Great Britain.—H. H. Howell.

District Surveyor.—W. Whitaker, B.A., F.R.S.

Geologists on the English Survey.—J. R. Dakyns, M.A.; R. H. Tiddeman, M.A.; H. B. Woodward; C. E. Fox-Strangways; J. J. H. Teall, M.A., F.R.S.; W. A. E. Ussher; A. C. G. Cameron; Clement Reid.

Assistant Geologists.—C. E. De Rance; F. J. Bennett; J. H. Blake; C. E. Hawkins.

Temporary Assistant Geologists.—A. J. Jukes Brown, B.A.; Aubrey Strahan, M.A.; W. W. Watts, M.A.; G. W. Lamplugh; W. Gibson.

Curators and Palæontologists.—G. Sharman; E. T. Newton, F.R.S.

Assistant in the Fossil Department.—H. A. Allen.

Fossil Collector.—J. Rhodes.

General Assistant.—Henry J. Gray.

SURVEY OF SCOTLAND.

Director.—H. H. Howell.

District Surveyor.—B. N. Peach, F.R.S.

Geologists.—John Horne, F.R.S.E.; W. Gunn; Hugh Miller; R. G. Symes, M.A.; B. N. Wilkinson.

Temporary Assistant Geologists.—C. T. Clough, M.A.; J. S. Grant Wilson; G. Barrow; Lionel W. Hinxman, B.A.; J. B. Hill; H. Kynaston, B.A.; A. Harker, M.A.

Curator of Geological Collections, Edinburgh Museum.—J. G. Goodchild.

Assistant in the Fossil Department.—A. Macconochie.

Fossil Collector.—J. Bennie.

General Assistant.—Robert Lunn.

SURVEY OF IRELAND.

Senior Geologist.—J. Nolan, M.R.I.A.

Geologists.—F. W. Egan, B.A.; J. R. Kilroe; Alexander McHenry, M.R.I.A.

Temporary Assistant Geologist.—W. J. Sollas, D.Sc., M.A., F.R.S.

Assistant in the Fossil Department.—Richard Clark.

MUSEUM OF PRACTICAL GEOLOGY, JERMYN STREET.

Director.—Sir A. Geikie, D.Sc., LL.D., F.R.S.

Registrar, Curator, and Librarian.—F. W. Rudler.

Assistant (to Curator).—A. Pringle, M.A., B.Sc.

Assistant Librarian.—C. V. Crook.

EDINBURGH MUSEUM OF SCIENCE AND ART.

Director.—Maj.-Gen. Sir R. Murdoch Smith, K.C.M.G. (late) R.E.

Keeper of Natural History Collections.—Prof. R. H. Traquair, M.D., F.R.S.

Curator.—D. J. Vallance.

Assistant in Natural History Museum.—W. Eagle Clarke.

Junior Assistant.—P. H. Grimshaw.

Assistants in Industrial Museum.—W. Clark; C. N. B. Muston; T. W. Nash.

Clerks.—A. B. Steele; W. Bell.

SCIENCE AND ART MUSEUM, NATIONAL LIBRARY, SCHOOL OF ART, AND ROYAL BOTANIC GARDENS, DUBLIN.

Visitors of the Science and Art Museum and Royal Botanic Gardens.—Lord Ardilaun, D.L., *President*; The Viscount Powerscourt, K.P., D.L.; The Earl of Rosse, K.P., F.R.S.; J. K. Ingram, Esq., LL.D., S.F.T.C.D.; Professor E. P. Wright, M.D., J.P.; Rev. S. Haughton, M.D., D.C.L., F.R.S., S.F.T.C.D.; J. R. Garstin, Esq., D.L., F.S.A.; C. Uniacke Townshend, Esq., J.P.; Samuel F. Adair, Esq., J.P.; Hon. Judge Boyd, LL.D.; J. C. Meredith, Esq., LL.D.; Sir Howard Grubb, F.R.S.

Trustees of the National Library of Ireland.—Very Rev. Monsignor Molloy, D.D., D.Sc.; J. T. Gilbert, Esq., LL.D., F.S.A., M.R.I.A.; Arthur Vicars, Esq., Ulster, F.S.A.; Professor E. P. Wright, M.D., J.P.; J. K. Ingram, Esq., LL.D., S.F.T.C.D.; John Joly, Esq., M.A., D.Sc., F.R.S.; Prof. Edw. Dowden, LL.D.; Lieut.-Colonel A. V. Davoren, J.P.; Sir Edward Sullivan, Bart.; Hon. Judge Boyd, LL.D.; Professor D. J. Cunningham, M.D., F.R.S.; Professor J. Mallet Purser, M.D., D.Sc.

General Administration.

Director.—
Chief Clerk.—H. B. White, M.A., C.E.
Clerk of Accounts.—C. W. Steele.
Clerk and Registrar.—G. S. Watts.

Science and Art Museum.

Keeper, Natural History Department.—R. F. Scharff, Ph.D., B.Sc.
Assistants in Natural History Department.—A. R. Nichols, B.A., M.R.I.A.; G. H. Carpenter, B.Sc.
Keeper, Art and Industrial Department.—T. H. Longfield, M.R.I.A., F.S.A.
Assistants in Art and Industrial Department.—J. J. Buckley; E. P. Alabaster.
Keeper of Herbarium.—T. Johnson, D.Sc.
Technical Assistants.—R. Pride; A. Mc Googan.
Museum of Irish Antiquities. Keeper.—Major MacEniry.

National Library of Ireland.

Librarian.—T. W. Lyster, M.A.
Assistant Librarians.—R. L. Praeger, B.A.; W. K. Magee.

Royal Botanic Gardens.

Keeper.—F. W. Moore, M.R.I.A.

Metropolitan School of Art.

Head Master.—James Brenan, R.H.A.
Assistant Master.—F. Luke.
Principal Mistress.—Miss M. Julyan.
Instructor in Modelling.—J. J. Hughes.
Assistants.—M. J. Buckley (*Machine Drawing and Building Construction*); Mrs. D. Barden; J. T. Miles; Miss A. Jacob.
Occasional Lecturers.—Prof. Alexander Fraser, M.B., *Artistic Anatomy*; Sir T. N. Deane, R.H.A., F.R.I.B.A., *Architecture*.

ROYAL COLLEGE OF SCIENCE, DUBLIN.

Dean of Faculty, Session 1894-95.—W. N. Hartley, F.R.S., F.C.S., F.R.S.E.
Secretary.—Lieut.-Col. G. T. Plunkett, M.R.A.S. F.R.G.S. (late R.E.).
Clerk (*Second Division*).—C. J. Bateman.

Professors.

Physics.—W. F. Barrett, F.R.S.E., M.R.I.A.
Chemistry.—W. N. Hartley, F.R.S., F.C.S., F.R.S.E.
Geology.—G. A. J. Cole, F.G.S.
Applied Mathematics and Mechanism.—W. McFadden Orr, M.A.
Botany.—T. Johnson, D.Sc., F.L.S.
Zoology.—A. C. Haddon, M.A., F.Z.S., M.R.I.A.
Descriptive Geometry, Engineering, and Mechanical Drawing.—J. Lyon, M.A.
Mining and Mineralogy.—J. P. O'Reilly, C.E., M.R.I.A.

Assistant to Professor of Physics.—W. Brown.
Assistant Chemist.—Hugh Ramage, A.I.C.
Assistant in Descriptive Geometry and Engineering (*Assistant in Drawing School*).—J. Taylor.
Assistant in Zoology and Botany (*also Demonstrator in Palæontology*).—
Demonstrator for Chemistry and Assaying.—E. A. Smith (*temporary*).
Demonstrator in Applied Mathematics.—J. P Johnston.

ROYAL HIBERNIAN ACADEMY.

Secretary.—S. C. Smith, R.H.A.

SUMMARY OF PRINCIPAL GRANTS.

Science.	Art.

To Science and Art Schools and Classes.

I. Payments to the Local Committees of Schools and Classes on the results of instruction, as tested by Examination, of Students of the Industrial Classes.

Science.	Art.
(*a.*) 2*l.* for a pass in the Elementary Stage, and 5*l.* and 2*l.* 10*s.* for a 1st and 2nd class respectively in the Advanced Stage of each subject except mathematics, for which see detailed scale at p. 30.	(*a.*) 1*l.* and 10*s.* for a 1st and 2nd class respectively in the Elementary Stage; and 3*l.*, 2*l.*, and 1*l.* for excellent and 1st or 2nd class, respectively, in the Advanced Stage, and for subjects in which there is no Elementary or Advanced Stage; and 6*l.* and 3*l.* for 1st and 2nd class respectively in Honours.
(*b.*) 8*l.* and 4*l.* for a 1st and 2nd Class respectively in Honours.	(*b.*) 3*l.* or less per student for works executed in local classes.
(*c.*) In Practical Chemistry and Practical Metallurgy 3*l.* for a pass in the Elementary Stage, 6*l.* and 3*l.* 10*s.* in the Advanced Stage.	(*c.*) 3*l.* for a student obtaining a Free Studentship or Local Scholarship.
	(*d.*) 15*l.* each for not more than two Art Pupil Teachers.
	(*e.*) 5*l.* for each student who obtains a National Scholarship or a Royal Exhibition, or who obtains admission to Training Class.

II. Prizes and medals are awarded to candidates.

Science.	Art.
(*a.*) Prizes to students successful in competition in the Advanced Stage of each subject and bronze medals to those obtaining a 1st Class in Honours. Certificates or cards to all successful candidates.	(*a.*) A few Queen's prizes to students who do best in the Examinations; and Gold, Silver, and Bronze Medals, and other prizes of Books, for the best works submitted in the National Competition of works of all the Schools of Art and Art Classes.

III. Science and Art Scholarships for Students of the Industrial Class, held locally, 4*l.*, 7*l.*, and 10*l.*, for the 1st, 2nd, and 3rd year respectively, on condition that a local contribution of 5*l.* a year is made. 60 Local Scholarships held at any School of Art (20 awarded each year) with maintenance allowance of 20*l.* a year and tenable for three years.

IV. Local Exhibitions, to be held by Students of the Industrial Classes at the Royal College of Science or the National Art Training School, London; the Royal College of Science, or the School of Art, Dublin; or at an approved Provincial Science College or School of Art; 25*l.* to meet an equal sum locally raised.

V. Grants for Buildings, Fittings, and Apparatus.

Science.	Art.
(*a.*) Not exceeding 2*s.* 6*d.* per square foot of internal area, or one half the amount provided either by voluntary contributions or by local rate, raised under the Technical Instruction Act or the Public Libraries Acts, or by both; up to a maximum of 500*l.* for buildings.	(*a.*) Not exceeding 2*s.* 6*d.* per square foot of internal area up to a maximum of 500*l.* for buildings.

(*b.*) Grants towards the purchase of apparatus, examples, and fittings are suspended, except in Ireland, while the Local Taxation (Customs and Excise) Act, 1890, continues in force.

VI. The Grants to Organized Science Schools are made on a special scale, see ages 36, 37, and 38.

Science.	Art.

VII. Aid to Students in attending the Royal College of Science, London, the National Art Training School, London, and the Royal College of Science, Dublin.

(*a.*) 21 Royal Exhibitions (seven awarded each year) with maintenance allowance of 50*l.* a year tenable for three years.

(*b.*) 66 National Scholarships (twenty-two awarded each year) with maintenance allowance of 30*s.* a week for 40 weeks in the year tenable for three years.

(*c.*) 18 Free Studentships (six awarded each year) tenable for three years, at Royal College of Science, London.

(*a.*) 16 National Scholarships (eight open each year) tenable for not more than three years at National Art Training School with maintenance allowance of 25*s.* a week for 42 weeks in the year.

(*b.*) 30 Royal Exhibitions (10 awarded each year) with maintenance allowance of 25*s.* a week for 42 weeks in the year, tenable for three years.

(*c.*) Free Studentships in National Art Training School.

VIII. Aid to teachers and persons preparing to become teachers in attending the Royal College of Science and the National Art Training School, London, the Royal College of Science and School of Art, Dublin, and Provincial Colleges at which advanced instruction in Science is given.

(*a.*) Grants of 3*l.* each with travelling expenses to local teachers selected to attend short courses of instruction at Royal College of Science.

(*b.*) Grants of 21*s.* a week each with travelling expenses to teachers in training selected to attend the sessional courses of the Royal College of Science.

(*c.*) Grants in aid of fees to local teachers selected to attend Provincial Science Colleges.

(*d.*) Free admission (subject to payment of examination fee) to courses of lectures at Royal College of Science to Science teachers.

(*a.*) Grants to enable masters and students to visit various metropolitan Art Institutions, and, in special cases, foreign towns, schools, and galleries.

(*b.*) Grants of 3*l.* each with travelling expenses to local teachers and students selected to attend short courses of instruction at National Art Training School and South Kensington Museum.

(*c.*) Grants of from 12*s.* 6*d.* to 48*s.* 6*d.* a week for 42 weeks in the year with travelling expenses to students selected to attend the National Art Training School as Students in Training.

To Local Museums.

IX. Grants to Local Museums and Loans of works of Science and Art, Books, and specimen sets of teaching Apparatus to Local Museums, Temporary Exhibitions, and Science and Art Schools.

To Training Colleges.

X. Aid to Training Colleges for Instruction in Science and Art.

Grants on results of the Examination on the scale stated at p. 57.

Grants of 15*s.* and 7*s.* 6*d.* on results of the Art Examinations as stated at p. 103.

To Elementary Schools.

XI. Aid to Elementary Schools for Instruction in Drawing and Manual Instruction.

(*a.*) Grants of 1*s.*, 1*s.* 6*d.*, or 2*s.* on average attendance of Schools examined in Drawing.

(*b.*) Grants of 1*l.* and 10*s.* for a 1st and 2nd class, respectively, in the Elementary Stages of Freehand and Model Drawing and Shading from the Cast; and 10*s.* for a pass in Geometrical Drawing.

(*c.*) Grants, for Manual Instruction, of 2*d.* a lesson—with the addition of 20 per cent. if the instruction is "Excellent."

(*d.*) Grants of 1*s.*, 1*s.* 6*d.*, or 2*s.* to Evening Continuation Schools for each Scholar taught Drawing.

For Technical Instruction.

In Ireland the sum of money in aid of Technical Instruction contributed from the rates by a Local Authority is supplemented by a grant from the Department of a similar amount.

SCIENCE AND ART DIRECTORY,

Containing the Rules and Regulations under which Aid to Science Schools and Art and Technical Schools and Art Classes is administered. The principal alterations made since the last edition of the Science and Art Directory are printed in italics.

CHAPTER I.

REGULATIONS COMMON TO SCIENCE AND ART.

Parliamentary vote.

I. A sum of money is voted annually by Parliament for instruction in Science and Art in the United Kingdom, and is administered by the Department of Science and Art.

Constitution of Department.

II. The head of the Department of Science and Art is the Lord President of the Council, assisted by a member of the Privy Council, who is called the Vice-President of the Committee on Education, and who acts under the direction of the Lord President, and for him in his absence. (Order in Council, 25th February 1856, Act 19 & 20 Vict. c. 116.)

Object of the grant.

III. The object of the vote is to promote instruction in Science and Art, especially among the industrial classes. The Vote is applied—

(*a.*) to the maintenance of the Science and Art Museums at South Kensington, in Dublin, and in Edinburgh; of the Royal College of Science and the National Art Training School at South Kensington; of the Royal College of Science and Metropolitan School of Art in Dublin; and of the Geological Survey of the United Kingdom and the Geological Museum in Jermyn Street;

(*b.*) in grants for Drawing and Manual Instruction in Elementary Schools; and

(*c.*) to aid in the establishment and maintenance of Science and Art schools and classes; of local Museums of Science and Art; and, in Ireland, of Technical Schools

The rules under which aid is given to Science and Art Schools and Classes and to local Museums are as follows; those under which aid is given for Drawing and Manual Instruction in Elementary Schools will be found at pp. 89 and 100.

NATURE OF AID.

Nature of assistance.

IV. The subjects of Science towards instruction in which aid is given are specified at p. 23, and those of Art at p. 63. This aid is granted in the form of—

(*a.*) Payments to the Committees of Schools and Classes on the instruction *as tested by examination, by students' attendance, and by inspection*, and certificates, prizes, medals, free Studentships, Scholarships, and Exhibitions to the Students.

(*b.*) Building Grants: and, in Ireland, Grants towards the purchase of apparatus, examples, fittings, &c.

(*c.*) The maintenance and instruction of teachers and students attending the Royal College of Science and the National Art Training School, South Kensington; the Royal College of Science, Dublin; and other approved centres.

(*d.*) Loans and grants to Local Museums and to Science and Art Schools.

(*e.*) Payments to Training Colleges for instruction in Science and in Art.

(*f.*) Grants for Technical Instruction in Ireland.

Conditions of aid.

V. Aid is only granted to Schools and Classes which have been approved by the Department, and are open at all times to the visit and inspection of its officers.

Forfeiture of grant.

VI. Grants may be withheld wholly or in part for any breach of the rules, or if the instruction or supervision is inefficient. The Department is the sole judge as respects all grants and awards, and its decision is final and conclusive.

Alteration in grant.

VII. The vote for Science and Art instruction is liable to be decreased and eventually discontinued. Its grants, which are intended to supplement and not to supersede local effort, must, therefore, not be looked upon as perpetual, or as in any way establishing a claim to any payments beyond those offered from time to time.

Management and local support.

VIII. Every School or Class must be under the superintendence and management of a local Committee, who are responsible for the engagement, employment, and payment of the teacher or teachers, and for all other

expenses connected with it. It must not be conducted for private profit or farmed out by the Managers to the Teacher; and it must have local support either in the form of fees and subscriptions or of rates. Grants cannot be made for Science or Art Classes in buildings which are not public institutions, unless such classes are held in the evening, and are open to the public.

Gratuitous instruction is only permitted where the school or class is supported by a local rate; or where considerable local contributions have been made to secure free instruction; or where classes have been but recently established, and it can be shown to the satisfaction of the Department that the circumstances of the locality justify such a course. No school or class will be permitted to charge abnormally low fees in order to compete with the others in the same locality. The Committees of Schools or Classes in a district should, therefore, consider the subject together, and fix some minimum fee for the district.

Students in a Training College; teachers, and pupil teachers, and holders of scholarships, exhibitions, and studentships, may be exempted from the payment of fees.

Forms obtainable.

*** Copies of any of the forms mentioned in this Directory will be supplied on application, personally or by letter, addressed to "The Secretary, Science and Art Department, London, S.W." The Department does not undertake to send them to Science and Art Schools and Classes in the absence of a special application in each case. The transmission of forms does not imply the recognition of the School or Class by the Department (*see* Form No. 170, page 104).

LOCAL COMMITTEES.

Local Committee.

IX. The Local Committee must consist of a Chairman, Secretary, and at least three other members. The offices of Chairman and Secretary cannot be held by the same person. The Department corresponds, as a rule, with the Secretary alone, and he is required to sign all communications from the School.

The Committee may be—

Constitution of Local Committee.

(1.) The Local Authority under the Technical Instruction Act, or the Committee to which it has delegated its powers under that Act; or a School Board; or the governing body of a School (not being a public elementary school within the meaning of the Elementary Education Act, 1870), with a scheme under the Endowed Schools Acts or the City of London Parochial Charities Act; or

(2.) A Committee formed for the special purpose of superintending and managing the School or Class under the Department.

If a Local Authority, School Board, or Board of Governors desire to act as the Local Committee of a

School for which they are responsible they must pass a resolution to that effect. This resolution, with the names and addresses of the members, must be transmitted to the Department and will remain in force until rescinded. All changes in the constitution of the Local Committee must be reported as they occur.

A Local Authority (or the Committee to which it delegates its authority under the Technical Instruction Act, 1889) or a School Board may appoint a Committee consisting wholly or partly of members of their body, and may delegate the duties of superintendence and management of the School to such Committee, provided that the members of this Committee who are not members of the Local Authority or of the School Board are such persons as would be eligible to act on a Committee under section (*a.*) below.

In other Schools or Classes, or where the Local Authority, School Board, or Board of Governors do not act in their corporate capacity as the Local Committee for a School or Class, the Committee to superintend and manage it must comply with the following conditions :—

Committee to consist of at least five members.

(*a.*) All the members of the Committee must be well-known responsible persons of independent position, who have no personal interest in the teachers of the school. The following are not eligible to be members of the Committee :—Candidates for examination by the Department or their Teachers in any subjects; relatives of Teachers under the Department; Teachers of Schools which have candidates for examination; and Teachers of Schools receiving Government Grants. A member of Committee must not take any part in an examination at which a relative of his is a candidate.

Chairman and at least one other member must be of position defined.

(*b.*) As many persons as possible in recognised positions of public responsibility in the district, such as mayors, provosts, town or county councillors, magistrates, members of school boards, trustees of grammar schools, clergymen of the Established Church in parochial employment, and ministers of religion in charge of legally recognised places of public worship, should be on the Committee. It is absolutely necessary that at least two such responsible persons should undertake to act on it. The Chairman, who will be required to certify that the constitution of the Committee is in accordance with the foregoing requirements, must be in a position of public responsibility as defined above.

Formation of Local Committee.

(*c.*) The proposed members of a Local Committee must sign Form No. 88. No one can act on a Committee, or assist in the conduct of an examination, whose membership has not been previously approved by the Department.

Renewal of Committee.

(*d.*) When a School or Class is first formed, the Form No. 88 must be signed at a general meeting of the Committee. If the same Committee continue to act the next year, it will only be necessary to fill up Form No. 168 at a meeting of the Committee. New members who are added to an existing Committee during the progress of a session should sign Form No. 88*b*.

New members.

(*e.*) A Local Committee may, with the sanction of the Department, supervise classes meeting in different places, but the Department will not recognise more than one Committee—except in the case of a Local Authority acting as such—for the supervision of instruction given in any one building. One Committee recognised for a building.

X. In order that a School or Class may be placed on the list of those eligible for grants the Committee must have been formed, or renewed, by the 31st October preceding the examination. When the Committee is approved the School or Class will be assigned a distinguishing "School Number," which must be quoted on all forms and correspondence. Department's approval of Committee.

(*a.*) A Committee which is formed under § IX., section 1, must transmit a certified copy of the resolution by which it is constituted.

(*b.*) A Committee which is formed under § IX., section 2, must forward Form No. 88 or, on renewal, Form No. 168.

(*c.*) A Committee which has been recognised by the Department continuously for three years, or a Committee formed by resolution, is not required to send in a renewal form year by year, but will be considered as continuing in office so long as it discharges its duties efficiently, or until the Department is informed that the members desire to relinquish their duties. The Secretary of the Committee should, however, report all changes in its constitution, and, in the case of a Committee formed under § IX., section 2, he should submit on Form No. 88B the signatures of new members, duly certified by the Chairman. Any alterations required by the Department must be completed by the 31st January preceding the examination (*see* Form No. 170, p. 105). Permanent Committees.

(*d.*) A table of memoranda for the use of Secretaries and Members of Local Committees will be found in Form No. 170, p. 104. Table of duties.

(*e.*) A deduction of half-a-crown is made from the next payments to the School for every day's delay in sending in a Form or a Return after the appointed date. Deductions for neglect.

XI. A Committee may be formed to provide for the examination of candidates on account of whose success neither payments nor prizes are to be claimed. Such a Committee should sign Form No. 88*c*, which must be sent to the Department before the 1st January preceding the examination for which application is to be made. Committee for conducting an examination only.

This Committee cannot be renewed by sending Form No. 168, but must be reconstituted from year to year.

PREMISES, FITTINGS, APPARATUS, AND EXAMPLES.

XII. That portion of the income of a School which is derived from instruction in Science or in Art must be applied wholly for the purposes of such instruction, and the Local Committee must provide and maintain suitable rooms for the instruction and for the examinations, with firing, lighting, apparatus (*see* Form No. 1284, p. 124), examples, &c. If at any time it appears that these are

unsatisfactory or insufficient, the assistance of the Department may be reduced or withdrawn.

The managers of an Elementary School under the inspection of the Education Department may allow the use of their premises for a Science School or Art Class, provided that the arrangement be not allowed to interfere injuriously with the primary purposes of such Elementary School (*see* sec. 11, p. 29).

Building Grants.

Building Grants.

XIII. A grant in aid of a new building, or for the adaptation of an existing building, for a School of Science or for a School of Art, may be made under conditions which are stated at p. 116.

The sum allocated to the payment of Building Grants will not exceed 10,000*l.* in any year; applications will therefore be considered in their order of receipt *in a complete form, with plans, &c.*

The application for a Grant, which will become payable out of the Parliamentary Vote for any year must be sent in on or before the 1st November in the preceding year.

Grants for apparatus.

N.B.—Grants for fittings, apparatus, and examples are suspended, except in Ireland, while the Local Taxation (Customs and Excise) Act, 1890, continues in force.

The conditions under which they are made in Ireland are contained in Form No. 48, which can be obtained on application.

TEACHING STAFF AND MEETINGS OF CLASS FOR INSTRUCTION.

Qualification of teachers.

XIV. In order to claim payments on results and prizes, the Teacher of a School or Class must be qualified in accordance with the rules laid down at pp. 24 to 26 for instruction in Science, and at pp. 66 to 70 for instruction in Art.

Number of lessons necessary.

XV. The class in each subject of Science, or group of subjects of Art, must meet under the instruction of a qualified teacher on at least 28 days during the session, each meeting being of at least one hour's duration on a separate day (*see* sec. 6, p. 26): and the instruction of all students upon whose examination a payment is to be claimed must commence within reasonable time after the 1st October preceding the examination on which payments on results are claimed and continue until the examination.

Should the instruction not commence and continue as above stated, or should less than 28 lessons have been given during the session the claim for payment on results will only be considered under very exceptional circumstances, and payments, if made at all, will be proportionately reduced.

Return on Form No. 120.

XVI. Every School or Class must, on its formation and annually before the 1st October, make a return on Form No. 120 of its Teaching Staff, with the Time Table of instruction for the current session; of its sources of

maintenance; and, in the case of an old School or Class, of the statistics for the past session.

a. If Form No. 120 be not received before 1st October, the Department may refuse to make payments on the results of the next examination. The acceptance of Form No. 120 after that date will be exceptional, and subject to a deduction from the grant. — Return a condition of payment.

b. The arrangements for the session returned on Form No. 120 are not necessarily final, but they must be adhered to until a letter intimating intended alterations has been sent to the Department and its receipt has been acknowledged. — Alterations to be reported.

c. Those lessons only which are given on the days and between hours previously reported to the Department, and which are given by teachers of whose appointment it has approved, and in the buildings which it has recognized for the meetings of the class, can be registered towards the number necessary for prizes or for payments on results. — Lessons to be in accordance with return.

Registration of Students.*

XVII. A general register must be kept in accordance with the instructions in Form No. 1069 (*see* p. 113) for each Science or Art School or Class, and an attendance register for each subject taught. The Committee are responsible for the accuracy of the registration, and no grants will be made or prizes allowed unless the registers are properly kept and certified. A member of the Committee visiting the school should record, in the space provided in the attendance register, the number of students who are present at the time of his visit, and should certify the entry with his signature and the date. — Registers. — Visits of members of Committee.

A Committee which makes no claim for payments on results is not required to keep a general register.

EXAMINATIONS.

XVIII. These are of two kinds: (*a*) The Personal Examinations of Students, and (*b*) The Examination of the Works executed by the students in the class during the session. — Nature of Examinations.

The Personal Examinations of students in Science and Art Schools and Classes and of Training Colleges are held annually about May. The examinations are open to external candidates. The subjects of the Personal Examinations in Science are stated at pp. 23 and 27, and in Art at pp. 71, 72, and 74.*

* It will be observed that on the 25th April, 2nd, 4th, 5th, 6th, 7th, 8th, 9th, 11th, 12th, 13th, 14th, 15th, 16th, 18th, 19th, 20th, 21st, 22nd May, 1st, 2nd, 3rd, 4th June, examinations in Science and in Art are held in whole or in part during the same hours. No candidate can, on any one of those dates, be examined in a subject of Science and also in a subject of Art the hours for which overlap.

For Navigation Schools additional examinations may also be held twice a year (*see* p. 29).

The EXAMINATION OF WORKS commences in April. The works are sent to the Department for that purpose. The details with regard to this examination are stated at p. 74.

CONDUCT OF EXAMINATIONS.

Who may act as Superintendents.

Number of Superintendents required.

Superintendents may relieve each other.

XIX. The examinations are conducted by Superintendents, who must be either members of approved local committees (§ IX.) or Special Local Secretaries and their assistants (§§ XXII. and XXIII.). Two Superintendents at least must be present in each room throughout the examination; and when there are more than 50 candidates in any room there must be an additional Superintendent for every additional 50, or fraction of 50, candidates. In the case of examinations conducted by Local Committees, superintendents may relieve one another, provided that the required number be always present. If the requisite number of Superintendents be not present at any period of the examination it cannot be accepted.

Attendance of Committee to identify students.

Member of Committee supplying place of Special Local Secretary or Assistant.

XX. When a Special Local Secretary has been appointed, members of the local committees within his district are relieved of the responsibility of conducting the examinations, but some of them should attend during a portion of each evening on which their school is examined in order to identify their own students; and to provide against the examination of their class failing from accidental circumstances. In case of the unavoidable absence of the Special Local Secretary, or his assistant, a member of the Committee should take his place.

For further detailed Rules, *see*, as respects Science, p. 130, and as respects Art, p. 138.

ARRANGEMENTS FOR LOCAL EXAMINATIONS.

XXI. If two or more Schools in the same town, or within a reasonable distance of one another, are to be examined, a general examination committee must be formed, by the amalgamation of the several Local Committees, to hold the examinations at some common centre or centres with an Examination Secretary, who must be a member of one of the Local Committees.

It is only when the local circumstances render an amalgamation of the Committees impracticable or undesirable that it will not be insisted upon.

When there are less than four candidates for examination in one place the Department may require them to go to a neighbouring centre.

The amalgamation of committees does not imply the appointment of a Special Local Secretary as provided for in § XXII.

Where an amalgamated examination is held, each Committee must furnish the Examination Secretary, or, if there be one, the Special Local Secretary, before the 16th of March, with a list of the names of the candidates for examination from the school which they superintend, and a statement of the subjects in which each candidate proposes to be examined. The Examination Secretary, or the Special Local Secretary, should refuse to provide accommodation for any candidate whose name has not been returned to him before he transmits the Application Form No. 119 to the Department. *See also* § XXVI.

Special Local Secretaries.

XXII. In large towns or populous districts where there are several Schools or Classes, and where numerous examinations are to be held, or where a large and important School is to be examined in a number of subjects, the Department may, on the application of the Local Committees, authorise the appointment—or if it should seem necessary, require the appointment—of a Special Local Secretary to manage the whole business of the examination.

Local Committees who wish to nominate a Special Local Secretary for the town or district in which they are situated should apply to the Department before the 10th February. When a Special Local Secretary has been appointed the Department corresponds with him alone on all subjects connected with the examination. He must arrange for holding the examinations at convenient centres, subject to the approval of the Department; the number of these centres being as few as possible. He is allowed a fee of half a guinea (*a*) for each night on which an examination in either Science or Art, or in both, is to be held; (*b*) for each afternoon of examination in Practical Chemistry or Practical Metallurgy; and (*c*) for each attendance of three or four hours' duration at Art examinations held in the day time. He is also allowed a fee of half a guinea for every seventy-five papers worked at the examinations.

Assistants for Special Local Secretary.

XXIII. Assistants will be appointed to help the Special Local Secretary. The number of assistants required will depend upon circumstances, and will be fixed by the Special Local Secretary, subject to the approval of the Department.

Each of the assistants will receive a fee of half a guinea for each night of examination, and for each afternoon of examination in Practical Chemistry or Practical Metallurgy on which he may

be required to be present and for each three hours' attendance at the Art examinations held in the day time or afternoon.

The Special Local Secretary may act in the place of an assistant on any night on which there is an examination at but one centre. Otherwise, as he is charged with the general supervision of the examinations, he is not to act in the place of an assistant except in the case of an emergency.

When the Special Local Secretary acts as an assistant, he will receive no additional fee.

Nomination and appointment of Special Local Secretary.

XXIV. The nomination of a Special Local Secretary rests with the Special Committee of the Local Committees, and the nomination of his Assistants with the Special Local Secretary.

When Local Committees are asked to nominate a Special Local Secretary, a Special Committee of the several chairmen, or an equal number of representatives from each Committee, should be formed for the purpose. The meeting, of which at least one week's notice should be given, will, as a rule, be convened by the Local Authority under the Technical Instruction Act (or by its Committee) when it supervises classes under the Science and Art Department, or failing these by the Chairman of the School which has been longest in connexion with the Department, but the meeting will elect its own chairman. The nomination or recommendation must be sent in by the Chairman of the Special Committee not later than 24th February. If the Special Committee fail to come to an agreement, or if it nominate a person of whom the Department cannot approve, the Department will appoint the Special Local Secretary. The appointment of the Special Local Secretary and Assistants rests with the Department, and is for one year only.

No persons who have relatives to be examined within their district or who are ineligible to act as members of a Local Committee (see § IX., sec. *a*) can act as Special Local Secretaries or as Assistants.

In the deliberations and voting of the Special Committee weight should be given to the opinions of the representatives of different committees in proportion to the number of classes and the number of students superintended by each committee. The details for giving effect to this principle are left to the locality to decide.

Local contribution toward the expenses of examination.

XXV. One moiety of the fund for paying the Special Local Secretary and the Assistants on the scale given in §§ XXII. and XXIII. must be contributed by the locality. When a certificate on Form No. 983 has been received from the Special Committee, that one moiety has been lodged with them, they will receive the other moiety from the Department.

A Special Local Secretary is empowered to require each school or class, having students for examination, to pay its contribution to the general expenses prior to the time of the examination; and to exclude from the examination the students of any school or class from which such contribution has not been received.

Examination of external Students.

XXVI. Committees are required to make arrangements for admitting outside candidates to any examinations they hold for their classes other than those in Practical Inorganic Chemistry; Practical Organic Chemistry; Practical Metallurgy; or Elementary Modelling; provided that the candidates apply to the Secretary of the Committee or to the Special Local Secretary, where one has been appointed, before the 15th March for admission to the examination. The Committee or Special Local Secretary may charge such outside candidates a fee not exceeding 2*s*. 6*d*. for each day or evening of examination for which they register their names in addition to a deposit of 2*s*. 6*d*. per subject (*see* sec. 7, p. 26).

This fee is not claimable on account of the students or Teachers of Science and Art schools and classes which are amalgamated for examination, or of those schools or students who are required either by the Department or by the local arrangements to go to any special centre for examination.

No outside student should be admitted to an examination unless he has made application, by the above-mentioned date, to the Secretary of the Committee holding the examination, or to the Special Local Secretary of the place where he proposes to be examined.

In the case of examinations held under a Special Local Secretary external candidates must apply to him and not to a Local Committee.

Individual candidates may be examined at South Kensington, as far as space will permit. A fee of 2*s*. 6*d*. per day or evening, or a composition fee of 10*s*. for any number of days or evenings (except for the examinations in Practical Chemistry and Practical Metallurgy), will be charged if application (on Form No. 325) is made before 15th March, and of 5*s*. for each day or evening afterwards, or, if made before 15th April, a composition fee of 20*s*. for any number of days or evenings. For Practical Chemistry and Practical Metallurgy the fee will be 5*s*. for each examination if application be made before 15th March, or 10*s*. for each examination if made later but before 15th April, and these subjects are not included in the composition fee previously specified. If there are more candidates than can be examined, the preference will be given to registered candidates for Exhibitions and Scholarships. Applications for examination at South Kensington cannot be received after 15th April.

Schools and Classes cannot be examined at South Kensington.

Application for Examination Papers.

Application Examination by Local Committee.

XXVII. Application by Local Committees for examination papers must be made to the Department on Form No. 119 before the 16th March. A list of the names of the Candidates to be presented and the Science and Art subjects to be taken by each Candidate must be forwarded on the fly leaf to Form No. 119, at the same time

as the application for papers. On the 21st March the Department's examination lists will be finally closed. Applications after the proper date, or such as have not been made STRICTLY in accordance with the rules, will not be entertained.

Application by Special Local Secretary or by Amalgamated Committee.

In places where a Special Local Secretary has been appointed under § XXII., or an Amalgamated Examination Committee has been formed under § XXI., Form No. 119 should be sent, not later than the 16th March, to the Special Local Secretary or the Secretary of the Amalgamated Committee, as the case may be, who will transmit it to the Department.

Rules.

The rules for conducting the examinations will be found for Science on Form No. 91, p. 130, and for Art on Form No. 965*c*, p. 138.

Department not responsible for errors.

XXVIII. All possible care will be taken that the examination papers shall be forwarded in accordance with the applications, and that the results shall be correctly issued. As, however, the number of schools and classes is very large, mistakes may occur. The Department cannot undertake to rectify them, nor will it be responsible for any loss which may accrue.

Custody of Examination Papers.

Custodian of Examination questions.

XXIX. With a view to avoid any possibility of the examination papers being tampered with, some person must be appointed for each district, who will make himself responsible for the custody and distribution of the packets of papers after their receipt by the post, and who, from the position of his residence and the nature of his other avocations, is enabled to do so. He may or may not be a member of a committee, or the Special Local Secretary, but no person who would be ineligible to act as a member of a committee can act as a custodian of examination questions (*see* § IX., sec. *a*.).

The packets of examination questions must not under any circumstances be permitted to pass into the hands of a teacher, of a candidate for examination, or of any other person interested in the success of the examination.

Local circumstances will dictate whether it be advisable to have one, or more than one, custodian for each district or section of a district.

XXX. A special meeting of all the committees, or of delegates from all the committees, in the district must be held to nominate the custodian. This meeting will be convened in the same manner as that laid down for the meeting for the appointment of a Special Local Secretary,

see § XXIV. This nomination, with the address of the gentleman nominated, must be submitted to the Department before the 24th February. If the nomination is approved the packets of examination questions will, in due course, be sent to him; he will be responsible for their safe custody and distribution to the superintendents of the examinations at the various centres.

Re-examination.

Re-examination

XXXI. Should there be at any time reason to suspect that an examination has not been properly conducted, or that particular candidates have not worked their papers fairly, the Department will investigate the case, and may require a further examination to be held in any manner it may deem advisable. If any candidate should fail to appear at such investigation, or decline to be re-examined, all his previous examinations may be cancelled.

PAYMENTS TO LOCAL COMMITTEES ON THE RESULTS OF EXAMINATIONS.

Conditions of payment.

XXXII. Payments are made to the committees of schools or classes for the instruction of students, on condition—

(i.) that the teacher is qualified under the regulations (*see* Science, secs. 5 and 5*a*, pp. 24 and 25, and Art, secs. *8* and *9*, p. 66).

(ii.) that the teacher has given at least 28 lessons during the session, and before the examination in the subject of Science, or group of subjects of Art, on which payment is claimed (*see* § XV.).

(iii.) that each student on account of whom a claim is made belongs to one or other of the following categories :—

Students for whose instruction payments are made.

(*a*.) Persons in the receipt of weekly wages, and their children not gaining their own livelihood;

(*b*.) Teachers and pupil-teachers of elementary schools in connexion with the English or Scotch Education Departments, or the National Board of Education in Ireland, and their children if not gaining their own livelihood;

(*c*.) Scholars in Public Elementary Schools within the meaning of the Elementary Education Acts; and Scholars who on

leaving the Elementary School are proceeding with their education in Science or Art Schools or Classes.

(*See* exception in Art, sec. 17 on p. 71 and sec. 3 on p. 89.)

(*d.*) Persons in the receipt of not more than 500*l.* a year from all sources, *i.e.*, who are allowed an abatement of the income tax; and their children if not gaining their own livelihood;

(*e.*) Students in a night class for industrial students which meets after 6 p.m. or, on Saturdays, after 2 p.m.

If at any time there is reason to suppose that the night class is not *bonâ fide* for Industrial Students, and largely attended by them, the Department may call on the Committee to certify that each individual on whom payment is claimed comes within one of the preceding categories.

(*See also* exceptions in Science, secs. 15 to 21, pp. 30 to 32, and in the special rules applying to Irish National Schools and Teachers, p. 59.)

(iv.) that each student on account of whom payment is claimed for any subject has received 20 lessons at least in (*a*) that subject of Science, or that group of stages in Mathematics, or (*b*) in the requisite group of subjects in Art—and that the attendances have been duly registered (*see* § XVII., sec. 6, p. 26, and Form No. 1069, p. 113).

Attendances supporting claim.

(v.) that all such attendances have been made since the last examination in the subject of Science or group of Art subjects at which the candidate was successful; within the two years immediately preceding the examination on account of which the claim is made; and in classes under the supervision of the same committee.

Claim for payments.

XXXIII. The details of the payments on results for Science are given at p. 30, and those for Art at p. 76. The claim for payments on results must be signed by the Secretary or Chairman and at least two other members of the Committee at a meeting of the Committee held specially to examine and certify the same (*see* p. 135 (Form 51) for Science, and page 144 (Form No. 526) for Art.

All claims for payments should be made as soon as possible after the results of the examinations are issued and before the 31st October. This is necessary in order to enable the Estimates for presentation to Parliament to be prepared. The attendance register must be sent with the claim. From all Schools of Art and Branches of Schools of Art; and from all Science Schools and Art Classes which have not been inspected during the session, *at a time other than when an examination is held*, the General Register must likewise accompany the claim.

REWARDS TO STUDENTS.

Medals, Prizes and Certificates.

XXXIV. The conditions on which medals, prizes and certificates are awarded to students are given at p. 40 for Science, and at p. 77 for Art. All claims for Prizes must be made before the 31st December succeeding the examination.

LOCAL SCIENCE AND ART SCHOLARSHIPS AND EXHIBITIONS.

Scholarships and Exhibitions.

XXXV. Grants are made to aid local efforts in founding Scholarships and Exhibitions on the condition that they are awarded on the results of a competition, and that a sufficient sum is provided for the special purpose of the Scholarship or Exhibition by the voluntary contributions of living persons.

Funds derived from endowments or from moneys held in trust, the donor being dead; subscriptions not raised for this definite purpose; and other mere surplus funds, will not be held as satisfying this condition. The Department may refuse to aid any Scholarship or Exhibition for which there is not a sufficient number of competitors.

Local Science and Art Scholarships.

XXXVI. SCIENCE AND ART SCHOLARSHIPS.—These Scholarships are for competition among the pupils of an Elementary School or Schools or of an organized Day Science School (*see* § 46, p. 40, *et seq.*). The object of the Scholarship is to enable the Committee of the local fund to maintain the successful competitor while pursuing his studies for one, two, or three years, at a day school approved by the Department where more advanced instruction is given than in an ordinary Elementary School.

The term elementary school includes any school, or department of a school, at which elementary education is the principal part of the education there given; but does not include any school or department of a school at which the ordinary payments in respect of the instruction, from each scholar, exceed ninepence a week, or which is conducted for private profit.

Contributions by locality and by Department.

XXXVII. The Managers of the local fund must contribute 5*l.* each year, and lodge that sum annually with the Department before 5th April. For the first year of tenure of the Scholarship, the local contribution will be supplemented by the Department with a grant of 4*l.*; for the second year with a grant of 7*l.*; and for the third year

with a grant of 10*l.* But it will rest with the locality to decide whether the Scholarship shall be tenable for one, two, or three years.

CONDITIONS—

Conditions.

a. With any number of students up to 100 on the register of the school or group of schools there can be but two such Scholarships; above 100 and up to 150, three; above 150 and up to 200, four Scholarships, and so on.

b. The Scholarship or Scholarships must be awarded in a *bonâ fide* competition to the most successful student or students in some examination of the school. The absolute terms of the competition and the award of the Scholarship will be left to the managers of the school, subject to the approval of the Department of Science and Art.

c. The scholar must, at the time of first appointment, be under 16 years of age on the 1st May in the year in which his appointment to a scholarship is made.

d. The teacher, pupil-teacher, or other paid servant of a school is not eligible.

e. The scholar must continue to attend a day school regularly while the school is open during a period of twelve months ending 31st July, and—

f. In his first year and in each succeeding year during which he holds his Scholarship, he must be presented at the May examinations in one or more subjects of Science or of Art and show by the results he obtains that he has made satisfactory progress, *or, in the case of a Scholarship held in an Organized Science School, must satisfy the Inspector as to his progress.*

Method of procedure.

Application for the Scholarship must be made on Form No. 280 before the 5th April. The examination on which it is awarded must be held, and the Form No. 281 submitting the name of the successful competitor must be sent in, before the 1st August. One moiety of the local contribution will be paid to the parent or guardian of the scholar by the Department on the 1st September, on the receipt of a certificate (Form No. 1066) from the managers that he is going on satisfactorily. The other moiety will be paid in the same way on the 1st February. The Department's grant becomes due after the results of the May examination in the subsequent year have been issued, and when the conditions of the Scholarship have been fulfilled. Application for its payment must be made on Form No. 282.

Continuance.

Should it be desired to continue the Scholarship for a second or third year, application must be made on Form No. 473. This form must be sent in as soon as the results of the scholar's examination, held at the close of his first or second year, are made known.

Local Science and Art Exhibition.

XXXVIII. LOCAL EXHIBITIONS.—A grant of 25*l.* per annum is made to the managers of the local fund who raise by voluntary contribution, and lodge with the Department before the 5th April, the like sum for the maintenance of a student at some college or school where a thorough course of science, or of art, instruction of an

advanced character may be obtained. His whole time must be devoted to instruction. The exhibition may last for one, two, or three years.

CONDITIONS— Conditions.

a. The Exhibition must be awarded in competition in Science or Art, at the May examinations of the Department. The managers may select the subjects of Science or branches of Art for the competition, and they may fix any relative amount of marks they consider best to assign to them.

b. The place or places where the Exhibition is to be tenable and where the student is to pursue his studies may be fixed by the managers, subject to the approval of the Department, provided that the Exhibitioner shall always have the option of going to the Royal College of Science—or the National Art Training School—South Kensington; the Royal College of Science—or the School of Art—Dublin, at which the fees for instruction will be remitted. If the Exhibition is held at the Institution applying for the Department's grant, the fees for instruction in it must be remitted to the Exhibitioner.

c. The Exhibitioner must be a student of the class on account of which payments on results are claimable, *see* § XXXII., sec. iii.

d. The grant of the Department will be paid from year to year on condition that a like payment has been made by the managers or Local Committee, and that the student has pursued his studies satisfactorily according to regulations fixed by the Department.

XXXIX. Application must be made for the Local Exhibition (Form No. 286) before the 5th April. It is awarded on the results of the May examinations, and the Department must be informed where the Exhibitioner will pursue his studies before the following 1st September. 10*l.* of the local contribution will be paid to the Exhibitioner by the Department immediately it is notified to it that he is commencing his studies. For the next three months of term, a further monthly payment of 5*l.* will be made out of the local contribution. 5*l.* per month for three more months will be paid from the Department's grant when a certificate (Form No. 851) has been furnished by the Principal of the Institution at which the Exhibition is held, stating that the Exhibitioner is going on satisfactorily. The payment of the balance (10*l.*) of the Department's grant will be made when the session terminates, and when a satisfactory report of the Exhibitioner's progress in his studies has been received from the Principal. Date of application.

If the Exhibition is held at the Royal College of Science—or the National Art Training School—South Kensington, 5*l.* will be paid to the exhibitioner monthly during the session by the Department.

Continuance.

Application for the renewal of the Exhibition for a second or third year must be made on Form No. 472 as soon as the payment of the Department grant towards the Exhibition for the preceding year has been made.

INSPECTIONS.

Inspection.

XL. When necessary an Inspector of the Department will visit the school or class, and report on the condition and suitability of the premises and fittings; the sufficiency of the apparatus, &c. used in the instruction of the school; the character of the instruction; the constitution of the Committee; and the manner in which the regulations are carried out. A meeting of the Committee must be held when the Inspector visits the school unless he considers it unnecessary.

GRANTS AND PRIVILEGES ALLOWED TO TEACHERS.

XLI. These are stated in detail at p. 43 for Science and at p. 82 for Art.

FREE ADMISSIONS TO MUSEUMS AND LIBRARIES.

Free Admissions.

XLII. Tickets of admission to the South Kensington —including the Science and Art Libraries—and to the Edinburgh Museum of Science and Art are given to Donors and lenders to the Museum, persons who are qualified to earn payments on results in Science or in Art, teachers of Public Elementary Schools, students of various public institutions, and *persons engaged in professions or trades connected with the decorative arts, or with engineering, manufacturing, or other technical pursuits; upon satisfactory evidence that they are "bonâ fide" employed in or studying for such careers, and that their means are limited.*

Application must be made by letter to the Secretary, Department of Science and Art, or to the Director of the Museum in Edinburgh.

Students must apply through the Secretary or Teacher of their School.

GRANTS TOWARDS THE PURCHASE OF OBJECTS, &c. TO MUSEUMS.

Grants to Museums.

XLIII. Grants in aid of the purchase of objects are made to Museums in connexion with Schools of Science or

Art, or established under a Municipal or a Local Authority.

The grants are primarily intended to assist local Museums in obtaining reproductions in plaster, or by the electrotype process, or by photography; but they are not absolutely limited to reproductions. Grants may be made for the purchase of original objects of decorative Art or of Science; but in considering the applications preference will always be given to those for reproductions.

The application for the grant must be accompanied by:—

(*a.*) A list of objects which it is desired to purchase.

(*b.*) A copy of the rules under which the Museum is administered, including those for the admission of visitors and of students.

Preparation and transmission.

Before a grant can be sanctioned the objects must be approved by the Department. No grant is made towards the cost of carriage of the objects. No object on which aid has been granted may be sold or exchanged without the permission of the Department.

Limit of aid.

The grant will, in no case, exceed one half the cost of the objects purchased; and it must be met by at least an equal amount raised locally by rate or voluntary contribution, exclusive of any sum received under the Local Taxation (Customs and Excise) Act, 1890.

Mode of procedure.

The grant will be paid on the receipt of a certificate that the objects have been paid for and deposited in the Museum (Form No. 132*a*), supported by the original vouchers with the receipts of the vendors.

Inspection.

The Museum in which the objects are exhibited must be at all times open to the inspection of the officers of the Department.

Report.

A report on the Museum, containing a return of the number of persons who have visited it, must be forwarded annually to the Department as soon as possible after the 31st December.

Application for grant.

All applications for grants must be made before the 25th July, so that they may be considered together with a view to the allocation of the vote available for such grants in the financial year.

LOANS TO SCHOOLS AND MUSEUMS.

Loans.

XLIV. Objects of Science and of Art are lent for exhibition to Schools of Science or of Art, and to Museums established under a Municipal or a Local Authority.

Exceptional loans.

XLV. Objects are also lent exceptionally to localities where no School of Science or Art or Municipal Museum exists, on conditions determined by the circumstances of each case, provided that the proceeds of the Exhibition are devoted to the furtherance or establishment of a School of Science or Art, or of a Municipal Museum.

Contents of Museum and Libraries.

XLVI. The Museum and Libraries at South Kensington contain objects, books, drawings, photographs, &c., illustrative of the following subjects :—

Machine Construction.
Building Construction.
Naval Architecture.
Theoretical Mechanics.
Sound, Light and Heat.
Magnetism and Electricity.
Chemistry.
Animal Physiology.
Botany.
Navigation.
Steam.
Physiography.
Principles of Agriculture.

and the following branches of art :—

Sculpture in Marble, Stone, &c.
Mosaics.
Carvings in Ivory, Bone, &c.
Woodwork.
Metal Work.
Coins and Medals.
Arms and Armour.
Silversmith's Work.
Jewellery.
Enamels on Metal.
Pottery and Porcelain.
Glass Vessels.
Stained Glass.
Leather Work, including Book Binding.
Textile fabrics.
Lace.
Musical Instruments.
Decorative Paintings.

Loans for Temporary Exhibitions.

Loans for exhibition.

XLVII. The conditions under which objects are lent for a short period are as follows :—

a. That the objects lent by the Department are supplemental to other contributions.

b. That adequate provision, previously approved by the Department, is made for exhibiting them.

c. That their security and safe return is guaranteed.

d. That the exhibition is open to the public, both during the daytime and the evening.

e. That students of the School are admitted free; that arrangements are made for the admission of artizans who are not students in the School at a reduced rate on certain evenings; and that, in the event of the Exhibition remaining open more than three months, it be free at least on one day and one evening in each week.

f. That any surplus in the receipts is applied for the benefit of the School or Museum with which the exhibition is connected.

Applications for the loan of objects must be made on Form No. 605. But the Department, whilst consulting the wishes of the local authorities as to the nature of the objects, reserves to itself the absolute right of selection.

The arrangements for the carriage of the objects should be made by the Local Committee, but the Department reserves to itself the right of forwarding the collection

by any route. The Committee is required to pay *half* the charges for carriage to the Exhibition and back When it is deemed advisable to send an attendant in charge of the collection the Committee is required to contribute 3*s*. 6*d*. a day towards his wages.

If any object be received in a damaged state a report of its condition should immediately be sent to the Department.

Glass cases, for the objects belonging to the Museum which require protection, will be provided by the Department, and every object will be accompanied by a descriptive label.

Loans for Permanent Museums.

XLVIII. Such loans remain at a Museum for twelve months; at the expiration of that period they are withdrawn, when a fresh contribution may be sent. Application for a loan should be made on Form No. 605*a*. Loans to Museums.

The conditions are the same as for loans for short periods, except that the Museum must consist of at least one room or gallery entirely devoted to the exhibition of objects, and must be open free at least on one day and one evening in each week.

Loans for Study in Schools of Science and Art.

XLIX. Apparatus, paintings, drawings, &c. are lent for the purpose of study to Schools of Science and Art and to Art Classes under local authority. These loans are of two kinds, (*a*) the deposit loan, the objects being left for considerable periods, and (*b*) the temporary loan usually made for about twelve weeks in the case of Art objects, and for about three weeks in the case of Science apparatus. The Committee are required to enter into the same guarantee for the safe custody and return of the objects as when they are lent for exhibition. Application should be made for Science apparatus, on Form No. 802, before the 1st October, and for works of Art on Form No. 668. Loans for study.

The deposit loan is principally to provide objects for still-life painting or special subjects of study.

Schools of Art are entitled to borrow two folios, four quartos, or eight octavo volumes at one time from the Art Library. Application for the loan must be made on Form No. 273. The books are lent for two months and must be kept in the School.

Specimens of students' works for the advanced stages, both those executed at the personal examinations and those submitted for examination at South Kensington, will be lent to Schools for a period not exceeding two weeks. Application should be made on Form No. 159.

TECHNICAL INSTRUCTION.

N.B.—These grants are suspended, except in Ireland, while the Local Taxation (Customs and Excise) Act, 1890, continues in force.

Technical Instruction in Ireland.

L. Grants will be made in Ireland in aid of Technical Instruction given under the Technical Instruction Act, 1889 [52 & 53 Vict.].

LI. The grant in aid will be made to the school aided by the Local Authority and will be equal in amount to the sum contributed by the Local Authority out of the rates for instruction in subjects other than those for which the Department gives aid under the Science and Art Directory; provided that the subjects of instruction have been approved by the Department, that the Inspector of the Department reports that the instruction is properly given, *and that the premises are suitable for the purpose.*

LII. The programme of instruction with the arrangement made by the Local Authority for its aid must be submitted to the Department, at the commencement of the school year, for sanction.

LIII. The payment of the grant allowed will be made at the end of the school year on the certificate of the officer of the Local Authority showing the amount contributed out of the rates and a detailed statement certified by the Committee or managers of the school of the expenditure of this money on instruction in subjects approved by the Department and not aided under the Science and Art Directory.

CHAPTER II.

REGULATIONS SPECIAL TO SCIENCE.

1. Aid is given towards instruction in the following Subjects of Science:— List of Science subjects.

Subject	I.	Practical Plane and Solid Geometry.
„	II.	Machine Construction and Drawing.*
„	III.	Building Construction.*
„	IV.	Naval Architecture.*
„	V.	Mathematics.
„	VI.	Theoretical Mechanics.
		a. Solids.
		b. Fluids.
„	VII.	Applied Mechanics.
„	VIII.	Sound, Light, and Heat, Elementary Stage.
		a. Sound, Advanced Stage, and Honours.*
		b. Light „ „ „*
		c. Heat „ „ „*
„	IX.	Magnetism and Electricity.*
„	X.	Inorganic Chemistry [Theoretical].
„	X*p.*	Inorganic Chemistry [Practical].
„	XI.	Organic Chemistry [Theoretical].
„	XI*p.*	Organic Chemistry [Practical].
„	XII.	Geology.*
„	XIII.	Mineralogy.
„	XIV.	Human Physiology.*
„	XV.	General Biology.
„	XVI.	Zoology.*
„	XVII.	Botany.*
„	XVIII.	Principles of Mining.
„	XIX.	Metallurgy [Theoretical].
„	XIX*p.*	Metallurgy [Practical].
„	XX.	Navigation.
„	XXI.	Nautical Astronomy.*
„	XXII.	Steam.
„	XXIII.	Physiography.
„	XXIV.	Principles of Agriculture.*
„	XXV.	Hygiene.

The subjects are subdivided into stages or courses—the Elementary, the Advanced, and Honours—with the exceptions shown in the syllabus, pp. 148 to 261.

In the subjects marked with an asterisk there may be a practical as well as a written examination in Honours (*see sec.* 10).

PREMISES, FITTINGS, AND APPARATUS.

A.—Building Grants (*see* § XIII.).

Building Grants.

2. The conditions of and the mode of application for, a grant to build or adapt a Science School will be found at p. 116.

N.B.—Grants for Fittings and Apparatus are suspended, except in Ireland, while the Local Taxation (Customs and Excise) Act, 1890, continues in force. The conditions under which they are made in Ireland are contained in Form No. 48, which can be obtained on application.

Instruction in Experimental Science.

3. Instruction in experimental Science must not be given without sufficient apparatus to illustrate the teaching. A list of the apparatus, &c., considered indispensable for teaching Subjects I., II., VI., VII., Elementary Physics, VIII., IX., X., XII., XIV., XVII., *XVIII.*, XXII., XXIII., XXIV., XXV., is given at page 124; for Science subject X*p.*, at page 210; for Science subject XI*p.*, at page 210; and for Science subject XIX*p.*, at page 244. The apparatus prescribed in each case is the minimum with which a class must be provided. No payments will be made, or examinations held in the Elementary stage in schools which are not furnished with that amount of apparatus; or—where advanced instruction is given—without sufficient apparatus to make the experiments referred to in the syllabus of each subject. The teacher may be called upon by the Inspector to show his ability to use this apparatus.

N.B.—Attention is directed to pages 202 and 209, from which it will be seen that any student on whom it is intended to claim payments in the Elementary Stage of subject Xp., Practical Inorganic Chemistry, or of Subject XIp., Practical Organic Chemistry, may be called upon by the Inspector of the Department, when visiting the Laboratory, to repeat some of the experiments which he has had the opportunity of witnessing.

Catalogues of apparatus.

4. Catalogue of apparatus, instruments, diagrams, &c. to illustrate the following sciences, will be sent on application :—

(Cat. No. 1.) Practical Geometry, Machine and Building Construction, Mechanics and Steam.
(Cat. No. 2.) Experimental Physics.
(Cat. No. 3.) Chemistry and Metallurgy.
(Cat. No. 4.) Geology and Mineralogy, Natural History (Physiology, Zoology, and Botany), Physiography and Agriculture.

Qualification of Science Teachers.

Qualification for earning payments on results.

5. In order to obtain payments on the results of instruction in a subject of Science, the teacher of the class must, before giving the instruction on which a claim is to be made, have obtained in that subject—

a. a First Class in the Advanced Stage at the May examinations; or

b. a class in "Honours;" or,

c. a certificate of the Royal College of Science, London, or of the Royal College of Science, Dublin; or,

d. a first class certificate in the advanced stage, or a class in Honours at the special examination in Training Colleges, see p. 55.

Holders of the Elementary Drawing Certificate (1st Class), or the Elementary School Teachers' Certificate D.; or the Second

Grade Drawing Certificate, are qualified to earn payments on results of their instruction in the Elementary Stage of Practical Plane and Solid Geometry.

Mathematics. In Mathematics, a First Class at the May examination in each stage qualifies the holder to earn payments on results in that stage, or in the preceding stages: and Honours in stages 3, 5, and 7, qualify in those and the preceding stages. A pass in stage 1 of the Training College examination qualifies in stage 1, 2, 3, 4. A pass in stage 2 of the same examination qualifies in all the stages.

In Theoretical Mechanics a first class in the advanced stage of subdivision (*a*) or (*b*) qualifies the holder to earn payments in that subdivision, and also in the elementary stage (*a*) and (*b*). Honours in (*a*) or (*b*) qualify the holder to earn payments in VI. (*a*) and (*b*).

In Sound, Light, and Heat a first class in subdivision (*a*) or (*b*) or (*c*) qualifies the holder to earn payments in that subdivision, and also in the common elementary stage.

Honours in subdivision (*a*) or (*b*) or (*c*) qualify the holder to earn payments in VIII. (*a*), (*b*), and (*c*).

Alternative course in Physics. The qualification to earn payments on results in either Subject VIII. or Subject IX. also qualifies in the alternative course in Physics.

Practical Chemistry and Metallurgy. In Practical Chemistry (Inorganic or Organic) or in Practical Metallurgy the Teacher must have obtained a First Class in the advanced stage or a success in Honours of both the theoretical and practical divisions of those subjects. This rule does not apply to Teachers who had been accepted by the Department and who had taught classes in Practical Chemistry or Practical Metallurgy before May 1883.

All persons who were qualified to earn payments on results in any subject of Science previous to July 1888, and who at that date were teaching, or had previously been teaching, a class in that subject under the Department of Science and Art, remain qualified to earn payments in that subject.

Certificates prior to 1867. The Science Teachers' Certificates awarded previously to 1867 still remain in force, and with regard to them and the alterations made in Subjects XV., XVI. in 1873, and in Subject XXIII. in 1876, information can be obtained on application to the Department.

Qualification without examination. 5*a*. The examination for qualification to earn payments on the results of Science instruction may be dispensed with in the case of—

(*a*.) the teachers of a school under the Public Libraries Acts; of a school (not being a public elementary school within the meaning of the Elementary Education Act, 1870) governed by a scheme under the Endowed Schools Acts or the City of London Parochial Charities Act, the Governors of which act, in their corporate capacity, as Local Committee, (see § IX., section 1); of a school which is under the control of a local authority under the Technical Instruction Act; or of certain other recognised public institutions.

Training College Teachers. (*b*.) teachers on the staff of Training Colleges who are regularly employed in them;

(*c*.) Associates of the Royal College of Science, London, or of the Royal College of Science, Dublin;

(*d*.) graduates of any university of the United Kingdom whose degrees cover the subjects they propose to teach;

Elementary School Teachers.

(*e.*) teachers certificated by the English or Scotch Education Department in respect of Mathematics (Subject V.) Stage 1;

(*f.*) teachers holding the Art Master's Certificate, Group I., dated previously to March 1893, in respect of Science Subject I.;

(*g.*) and, exceptionally, other specially qualified persons.

Formal application by Committee necessary.

All applications for exemption under these sections must be made by the Committee of the School under which the teacher is to act. The application must be made before he commences to teach, and must, in the case of a University Graduate, be accompanied by his diploma or a certificate from the registrar of his University.

Irish Schools.

Special rules for Irish Schools and Classes will be found at p. 59.

REGISTRATION OF STUDENTS.

Limitations.

6. A student may not be registered for lessons in more than two subjects on any one day, or for more than one lesson in any one subject—except on a Saturday, when lessons in three subjects may be registered. Each lesson must be of at least one hour's duration.

Under certain circumstances, on special application and where sufficient reason is shown the Department may sanction in day schools the registration of attendance at instruction in Science subjects, though such instruction is of but 45 minutes' duration. Where such sanction is accorded 40 lessons at least must be given in each subject by the teacher during the session; each student on account of whose success a claim is made must have been registered as present at not less than 30 such lessons; and all the Science instruction of the school (except in Subjects X*p.*, XI*p.*, and XIX*p.*), must be given in 45 minutes' lessons.

When lessons of 45 minutes' duration are exceptionally sanctioned, such lessons may be registered in three subjects on one day.

The lessons in Subject X*p.* Practical Inorganic Chemistry, XI*p.* Practical Organic Chemistry, and XIX*p.* Practical Metallurgy, must be each of at least one hour and a half's duration.

No student may be registered as attending instruction in a subject of Science in which he is also receiving instruction in an Evening Continuation School.

Time Table.

The time table, Form No. 120, should provide for a sufficient interval between the end of one lesson and the beginning of the next, to allow a change of students, and any necessary apparatus to be set up.

EXAMINATIONS.

Examination how held.

7. The examinations in the three stages of a subject—or in Mathematics, in a group of stages—are as a rule held at the same time, a separate series of questions being given in each stage. The Elementary and Advanced stages are for the general students in Science Classes. The "Honours" examination is of a very advanced character. In the elementary stage the candidates are recorded "passed," "fair," or "failed." In the advanced stage and in Honours there are two grades of success—first and second class. For a "pass" in the elementary stage, the standard of attainment required is about 60 per cent. of the marks obtainable, while a student who obtains more than about 40 per cent. of the marks obtainable will be recorded as "fair"; but the standard may be raised from year to year

The Department may require from a Local Committee a payment of 2*s.* 6*d.* for every paper of answers in any subject of Science which the examiner reports as obtaining less than 25 per cent. of the marks. A Local Committee may, therefore, call upon any candidate who against their wish insists upon entering for examination in any subject to deposit 2*s.* 6*d.*, to be returned if the Department does not require such payment from the Committee. External candidates may be required by the Local Committee, or Special Local Secretary, to make a similar deposit of 2*s.* 6*d.* for each subject of examination, in addition to the usual examination fee. (*See* § XXVI.)

Classification of results of examinations.

8. The examinations in the subjects and stages bracketed together in the following time-table will be held on the same evening. No candidate can be examined in more than one of these bracketed subjects in any one year, or in two stages of any subject except Mathematics, in which subject he may take one stage in each group. (*See* Note to § XVIII.)

TIME TABLE OF SCIENCE EXAMINATIONS IN ENGLAND, SCOTLAND, AND WALES.

In the year 1896 the examinations will be held as follows:—

1896.		p.m.	
25 April,	Saturday	6 to 10	I.—Practical Plane & Solid Geometry.*
2 May	Saturday	6 to 10	II.—Machine Construction and Drawing.
		„	III.—Building Construction.
		„	IV.—Naval Architecture.
4 „	Monday	7 „ 10	XXIII.—Physiography.
5 „	Tuesday	„	XVIII.—Principles of Mining.
			V.—Mathematics, Stages 6 and 7.
			XXIV.—Principles of Agriculture.
6 „	Wednesday	7 to 10.30.	V.—Mathematics, Stages 1, 2, 3.
7 „	Thursday	7 „ 10	IX.—Magnetism and Electricity, including Alternative Elementary Physics.†
8 „	Friday	„	VIII.—Sound, Light, and Heat, Elementary Stage.‡
			VIIIA.—Sound, Advanced Stage and Honours.

* *No candidate may be presented in both Geometrical Drawing (Art) and in Science Subject I., in the same year.*

† No candidate may be examined in both alternative Elementary Physics and in subjects VIII. or IX.

‡ Candidates in the first stage must take it as a whole, and will be expected to answer questions in Sound, and in Light, and in Heat.

In the second stage, and in the examination for Honours, the subject will be taken in three sub-divisions, and a candidate will be allowed to take up one or more of the sub-divisions, viz., Sound, Light, or Heat, in the same or in different years. But no candidate may offer himself for the Honours examination in any sub-division unless he has passed the second or advanced stage in that sub-division.

1896.		p.m.	
9 May,	Saturday	2.30 to 10.30.	XI*p*. Practical Organic Chemistry. — Elementary Stage, 6 to 9.30 p.m. Advanced Stage, 6 to 10.30 p.m. Honours, 2.30 to 10.30 p.m.
11 „	Monday	7 „ 10	VIA.—Theoretical Mechanics. Solids.
12 „	Tuesday	„	X.—Inorganic Chemistry, including alternative Elementary Chemistry.*
13 „	Wednesday	„	VIB.—Theoretical Mechanics. Fluids.
14 „	Thursday	„	XIV.—Human Physiology.
15 „	Friday	„	XI.—Organic Chemistry. / XXII.—Steam.
16 „	Saturday	2.30 to 10.30	X*p*. Practical Inorganic Chemistry.† — Advanced Stage, 6 to 10.30 p.m. Honours,‡ 2.30 to 10.30 p.m.
18 „	Monday	7 to 10	V.—Mathematics, Stages 4 and 5. / XXV.—Hygiene.§
19 „	Tuesday	„	XX.—Navigation. / XII.—Geology.
20 „	Wednesday	„	VIIIB.—Light, Advanced Stage and Honours.
21 „	Thursday	„	XV.—General Biology. / XIX.—Metallurgy.
22 „	Friday	„	VIIIC.—Heat, Advanced Stage and Honours.
1 June,	Monday	„	XIX*p*.—Practical Metallurgy, Elementary Stage.
2 „	Tuesday	2 to 10	XIX*p*. Practical Metallurgy. — Advanced Stage, 6 to 10 p.m. Honours, 2 to 10 p.m.
3 „	Wednesday	7 „ 10	VII.—Applied Mechanics. / XVI.—Zoology.
4 „	Thursday	„	XVII.—Botany.
5 „	Friday	6 „ 9	XIII.—Mineralogy. / XXI.—Nautical Astronomy.
6 „	Saturday	6 to 9.30	X*p*.—Practical Inorganic Chemistry, Elementary Stage.†

This time-table is modified in Irish Schools, *see* section 4, p. 59.

Examinations in Practical Chemistry and Metallurgy.

9. Examinations in Practical Chemistry (Subjects X*p*. and XI*p*.) and in Practical Metallurgy (Subject XIX*p*.) are only held in schools provided with a laboratory which has been accepted as fulfilling the requirements detailed at pages 204, 210, and 244.

* A paper will be set in the First Stage of Inorganic Chemistry, and also in the alternative First Stage, and a candidate may take either paper but not both.

† No candidate may be examined in the same year in the Elementary Stage and also in the Advanced Stage, or Honours, of Practical Inorganic Chemistry or of Practical Metallurgy.

‡ After the year 1896 candidates for Honours in Practical Inorganic Chemistry will probably be examined at certain fixed centres.

§ No candidate can obtain Honours in Subject XXV. unless he has previously passed in its Advanced Stage, and in the Advanced Stage of Subject XIV.

Where the number of candidates for examination exceeds the number of benches fitted up in the laboratory, they may be examined in divisions. Not more than two such divisions will be allowed, and the number of candidates in each division must not exceed the number of benches. This arrangement can, however, only be allowed where there are separate classes working at different times, and where the Inspector reports that it is justifiable. Thus, if the laboratory is fitted up with, say, 12 benches, and there are no candidates in Honours, 24 candidates may be examined in the Advanced Stage and in the Elementary Stage in divisions of 12 each.

A double examination in Practical Metallurgy will be allowed where four muffle furnaces as well as the other necessary furnaces have been provided for the laboratory. Thus the minimum number of students for which a double examination can be claimed will be 13.

Practical Examinations.

Practical Examinations at South Kensington.

10. Practical examinations for candidates in Honours in Subjects II., III., IV., VIII., IX., XII., XIV., XVI., XVII., XXI., and XXIV., may be held at South Kensington in addition to a written examination (*see* syllabus of each subject). Such practical examinations will be held as early as possible in the month of June. Candidates who are instructed to attend these examinations receive a maintenance allowance of 7*s.* 6*d.* a night while required to be absent from home and third class railway fare; but no cab or omnibus fares are allowed.

Pupils of Elementary Schools.

Pupils of an Elementary School.

11. No pupil in an Elementary School receiving aid from the English or Scotch Education Departments may be presented for examination by the Department of Science and Art, or registered in any subject of Science, unless he has *on or* before 1st November preceding the examination been placed altogether in Standard VII. of the English Code or has passed Standard VI. of the Scotch Code.

No one may be presented for examination by the Department of Science and Art in any subject in which he has been examined, since the preceding 1st August, by the English or Scotch Education Departments for a Class or specific subject grant. With regard to pupils of Irish National Schools, *see* Form No. 1234, p. 59.

Special Examination of Navigation Schools.

Special examinations in navigation.

12. In addition to the ordinary science examinations in May, examinations may be held in Mathematics, Navigation, Nautical Astronomy, and Steam, for the benefit of seafaring men—and for them only—twice a year in all seaports where Local Committees are formed and are willing to undertake them. These examinations take place in the beginning of February, and November. The application for these examinations must be made on Form No. 119 before the 10th day of the previous

month. They are only allowed when there are at least 15 candidates for examination in the United Kingdom.

The payments on the results of these examinations are on the scale laid down for the May examinations (sec. 14), and the regulations with regard to Committees (§ IX.), registers (§ XVII.), and number of lessons (§§ XV. and XXXII.), are the same.

Conduct of Examinations.

Rules for examinations.

13. The detailed regulations for the conduct of the examinations, together with the instructions to candidates and the form of certificate to be signed by the superintendents, are given in Form No. 91 (*see* p. 130). For Irish schools in Form No. 91*b*. For Practical Chemistry, Analysis, in Form No. 91*d*., and for the written examination in the Advanced and Elementary Stages in Form No. 91*e*. For Practical Metallurgy in Form No. 91*m*. The requisite forms are issued, in due course, to Local Committees and Special Local Secretaries who have furnished returns on Form No. 119 (*see* § XXVII.).

PAYMENTS ON RESULTS.

Payments claimable on the results of the Class Examinations.

14. The Scale of payments on results, except in Organized Science Schools and Training Colleges, for which see pp. 36 and 57 is :—

(*a*.) 2*l*. for a pass in the elementary stage of each subject;

(*b*.) 5*l*. and 2*l*. 10*s*. for a first or second class respectively in the advanced stage of each subject; and

(*c*.) 8*l*. and 4*l*. for a first or second class respectively in Honours :—

(*d*.) except that in Practical Inorganic and in Practical Organic Chemistry and in Practical Metallurgy, the payments are 3*l*. for a pass in the elementary stage, and 6*l*. and 3*l*. 10*s*. for a first or second class respectively in the advanced stage; and in Mathematics, 2*l*. for a pass in stage 1, 3*l*. and 2*l*. respectively for a first or second class in stages 2 and 4, 4*l*. and 3*l*. for a first or second class respectively in stage 3, 5*l* and 4*l*. for a first or second class respectively in stages 5, 6, and 7, and 8*l*. and 4*l*. respectively for a first or second class in Honours; and

Payments are made on each subdivision of Subject VI., Theoretical Mechanics, as a separate subject. In Subject VIII., Sound, Light, and Heat, the three subdivisions in the Advanced and Honours Stages are paid on separately.

A specimen of the manner in which the claim for payment (Form No. 51, or for Irish Schools, Form No. 51A) should be filled up is given at p. 137. Many details with regard to payments will be understood from the illustrations given in this form.

Previous success.

15. No payment is made on account of a student who has been previously successful in a higher stage of the same subject. If the student has been previously successful in the same stage of the same subject, either at a Training College Examination or at the May Examinations, the payment on his account will be reduced by the payment which would be claimable on such previous success; but when such previous success has been obtained in a school or class under the same Local Committee, and has not been paid upon, the Department may allow the full claim.

For instance, the payment of 5*l.* for a first class in the advanced stage would, if the student had previously taken a second class in that stage of the same subject, be reduced by 2*l.* 10*s.*

No deduction is made in the payment for the first stage of Subject I. on account of a previous payment for section 1 of that subject.

A charge of 2*s.* 6*d.* will be made for each paper of answers which the examiners report as obtaining less than 25 per cent. of the marks.

16. No payments are made in Honours, unless the student has already passed in the elementary or in the advanced stage of the subject after instruction in a Science School in connexion with the Department. Honours.

Students on account of whom no payments are made for passing in the elementary stage under sec. 21 are not required to comply with this rule. Numbers of subjects paid upon.

Payments will not be made on account of the same student in any one year in more than two subjects other than Subject I. (Practical Plane and Solid Geometry), and Subject V. (Mathematics). That is to say, either or both Subjects I. and V. may be taken in addition to any two other subjects. Subject V. (all the stages of Mathematics); Subject VI., divisions *a* and *b*; Subject VIII., divisions *a*, *b*, and *c*. Subject X. with X.*p* (Theoretical and Practical Inorganic Chemistry); Subject XI. with XI.*p* (Theoretical and Practical Organic Chemistry); and Subject XIX. with XIX.*p* (Theoretical and Practical Metallurgy); are each considered as one subject in the interpretation of this rule.

Grants are not made for instruction in subjects of Applied Science which are inappropriate to the students in the locality. A certificate will in all cases be required from the Committee of the class in which Subject XVIII., XX., XXI., or XXIV. is taught, that the students are, or are going to be, employed in a trade or industry to which the subject applies, or are going to be teachers of the subject. Grants only for appropriate subjects.

17. Except under special circumstances, no payments are made on account of instruction in Stages 1, 2, and 3 of Mathematics to the Committee of a school in which approved instruction is not also given and examination held by the Department, in at least one other subject of Science.

18. To obtain payments for Practical Inorganic, or for Practical Organic, Chemistry, or Practical Metallurgy, the school must be provided with a laboratory fitted according to the Syllabus, pp. 204, 210, and 244. A certificate to this effect must be given by the committee on Form No. 120 (§ XVI.). Practical Chemistry and Metallurgy.

19. Payments not exceeding 3*l.* for each student are made under the Art Rules, sec. *31d*, for works executed by students in Science Schools in Subjects I., II., III., and IV., and submitted in accordance with secs. 28, 29, and 30, pp. 74 and 75; Extra grants in Subjects I., II., III. and IV.

provided that the teacher is qualified to earn payments on results in the subject in which the works are submitted. Prizes are awarded for Works in these subjects.

Payments on Pupils of Endowed Schools.

20. The grant of payments to an endowed school, the endowment of which, applicable to the general maintenance of the School, exceeds 300*l.* a year, or in which the education is wholly or principally provided for by endowments, must be the subject of special reference to the Department; each case being considered on its merits.

Instruction in Institutions receiving State aid.

21. No grants are made in those branches of Science which are taught in Institutions receiving State Aid,—such as the Queen's Colleges in Ireland, the Royal College of Science, London, the Royal College of Science, Dublin, and the Royal Dockyard Schools—on account of the pupils who are, or have been, students of those institutions.

In the case of University Colleges in Great Britain which receive grants from the State under the Treasury Minute of 1st July 1889, payments are only made on account of the students of special evening classes for artizans, held in the colleges; and a certificate is required from the college authorities that no student on account of whom a claim is made is, or has been, a student of the day classes of the college in the subject or subjects in respect of which the claim is made.

A pass in the Alternative Elementary Stage of Physics is registered as a pass in the elementary stages of both Subjects VIII. and IX., and no second payment will be made on account of a pass in either subject. A pass in the Alternative Elementary Stage of Chemistry is registered as a pass in the elementary stage of Subject X., and no second payment will be made on account of a pass in that subject.

See also section 11 and page 23.

The restrictions in Dockyard Schools (*i.e.*, Engineers, Engineer Students, and Dockyard Apprentices), are as follows:—No payments or prizes for Engineer students and Dockyard apprentices, major trades.

a. Lower Division on account of success in Subjects V. (Stages 1, 2, and 3), VI. (Elementary Stage).

b. Upper Division in Subjects I. (Elementary stage), V. (All stages), VI. (All stages), VIII. (Elementary stage), IX. (Elementary stage), X. Theory (Elementary stage).

c. Dockyard Apprentices (major trades) of the Upper Division in Subject IV. (Elementary and Advanced stages).

d. Engineer Students of the Upper Division in Subjects VII. (All stages), XXII. (All stages).

No payments are made for Subject V., Stage 1, on account of Male Pupil Teachers and Male Assistant Teachers in Elementary Schools under the English or Scotch Education Department, or on account of Male Teachers trained at the public expense.

No payments are made for Subjects X*p.*, XI*p.*, or XIX*p.*, unless the laboratory in which they are taught has been approved as satisfying the conditions laid down.

ORGANISED SCIENCE SCHOOLS.

22. *An Organised Science School is one in which the instruction is carried on methodically according to one or other of the courses laid down in the following rules or according to a course which has been specially submitted to and approved by the Department. The work of the Organised Science School may be carried on either in day classes or in evening classes, but no Organised Science School will be recognised as such unless it has at least* 20 *students at its formation, nor will it continue to be recognised beyond two years after its formation unless it has a fair proportion of students taking the advanced course.*

23. *An Organised Science Day School must provide a thorough and progressive course of education in Science combined with literary or commercial instruction adapted to students whose education is such as would fit them to enter Standard VII. of the English code for a Public Elementary School. The Committee of the Organised Science School will be required to certify that no payment is claimed on account of any student (a) who has not passed out of Standard VI. of a Public Elementary School in England or Scotland or the 2nd stage of the 5th class in Ireland, or (b) who has not received an education equivalent to the above in some other school before entering the Organised Science School.*

24. *The courses of instruction for students of an Organised Science Day School of either sex are given in* §§ 26, 27, 28, *and* 29. *Some of the subjects specified are obligatory on all students; and some of the courses are alternative to suit different categories of students.*

25. *In the Organised Science Day School every student upon whom the variable grant* (see § 33 (2)) *is claimed must be presented in the obligatory subjects of Science, in the obligatory Art subject, in at least one language, and also in some literary or commercial subjects which have been approved in the time-table submitted to the Department. Not less than* 18 *hours per week must be allotted to instruction in the Science and Art subjects, and not less than* 10 *hours for the other subjects, including two hours for Manual Instruction.**

26. Course for Men Students.

Elementary Course.

1. *Elementary Mathematics (as in Stage I., Sub. V.).*	*Obligatory.*
2. *Elementary Physics, including the fundamental principles of Mechanics (theoretical and practical).*	
3. *Elementary Chemistry (theoretical and practical).*	
4. *Freehand Drawing.*	
5. *Elementary Practical Geometry.*	

* *This last condition will not come into force till after the commencement of the school year 1897.*

This course may extend over two years, which will afford sufficient time for such thorough and progressive instruction in that which must be looked upon as the basis of their future studies in Science as will fit the students for the advanced course.

Reasonable latitude will be allowed to the teacher as to the nature of the course he may pursue provided the instruction is sound, satisfactory in amount, and combined with proper practical work. The Practical Chemistry for the first year's course should include the setting up of apparatus, weighing and other chemical manipulations, the preparation of gases, the estimation of volume, and so on. Analysis should occupy a secondary position. The experimental work in physics and the principles of mechanics should be as far as possible quantitative in character, and should lead to numerical results. It should be simple in character and of sufficient variety to keep up the interest of the students. Further, it must be understood that the above course is the obligatory minimum, and that it is not to be taken as a limit: so long as these subjects are fairly taught there is no objection to their being added to or expanded. Thus besides Freehand Drawing may also be taken Model Drawing; and under Practical Geometry, may be taken Mechanical Drawing.

Advanced Courses.

27. *On the completion of the elementary course the work of the students should be specialised in one or other of the following advanced courses which have been drawn up for the Physical, Chemical, Mechanical, and Biological Divisions. Other special advanced courses, such as for Mining and Agriculture, may be sanctioned, but they must be previously submitted to the Department for approval.*

Physical and Chemical.

1. *Mathematics, Subject V., Stage 2, 3, or 4.*
2. *Geometry, Subject I., Advanced Stage.*
3a. *Sound, Advanced Stage.*
b. *Light,* „
c. *Heat,* „
} *Subject VIII.*
d. *Magnetism and Electricity, Subject IX., Advanced Stage.*
4. *Inorganic Chemistry, Subject X., Theoretical and Practical.*

} *Obligatory.*

5. *Theoretical Mechanics, Subject VI., Division I. or II.*
6. *Physiography, Subject XXIII.*
7. *Organic Chemistry, Subject XI., Theoretical and Practical, 1st Stage.*
8. *Subjects of Art Instruction* (see *syllabuses, pp.* 262–290).

It is only necessary that one of the four sub-divisions of Physics should be taken, but whichever sub-division is taken practical instruction in it must be given. The choice of one of the additional subjects, Nos. 5–8, *is left to the school.*

In Geometry, Subject I., the Elementary Stage may be taken provided that a fair proportion of the students are instructed in the Advanced Stage.

The Theoretical Chemistry must be the Advanced Stage of the Directory, but the Practical may be either the Elementary or Advanced Stage.

Mechanical.

1. *Mathematics, Subject V., Stage 2, 3, or 4* -
2. *Geometry, Subject I., Advanced Stage.*
3. *Heat, Subject VIII.c, Advanced Stage (with Practical Instruction).*
4. *Theoretical Mechanics, Subject VI., Divisions I. and II.*
5. *Building or Machine Construction, Subjects II. or III.*

} *Obligatory.*

6. *Applied Mechanics, Subject VII.*
7. *Inorganic Chemistry, Subject X., Theoretical and Practical, as above.*
8. *Subjects of Art Instruction.*

Biological.

1. *Geometry, Subject I., Advanced Stage.*
2. *Physiology, Subject XIV., with practical work; or*
   General Biology, Subject XV., with practical work.
3. *Botany, Subject XVII., with practical work.*
4. *Inorganic Chemistry, Subject X., Theoretical and Practical, as above.*

} *Obligatory.*

5. *Magnetism and Electricity, Subject IX., Advanced Stage, with practical work.*
6. *Mathematics, Subject V., Stage 2, 3, 4.*
7. *Sound, Light, or Heat, Subject VIII.a, b, or c, Advanced Stage.*
8. *Hygiene, Subject XXV.*

   In the Mechanical and Biological courses the same proviso as regards Subject I. will apply as in the Physical and Chemical course.
9. *Subjects of Art Instruction.*

28. Course for Women Students.

If it be considered more desirable, one of the courses prescribed for men may be adopted for women in lieu of the following:—

Elementary Course.

1. *Elementary Mathematics.*
2. *Practical Geometry.*
3. *Chemistry, Elementary, Theoretical and Practical.*
4. *Freehand Drawing.*
5. *Elementary, Physiology and Hygiene, or*
6. *Elementary Botany, or Elementary Physiography.*

} *Obligatory.*

The time-table must also include such subjects as Cookery, Household Management, Dressmaking, French, English Literature, History, and Geography.

29. **Advanced Course.**

1. *Mathematics, Subject V.. Stage 1.*
2. *Geometry, Subject I., Elementary or Advanced Stage.*
3. *Hygiene, Subject XXV.*
4. *Physiology, Subject XIV., or Botany, Subject XVII., both with practical work.*
5. *Physiography, Subject XXIII.*

} *Obligatory.*

6. *Model Drawing and Shading from the Cast.*

In Physiology and Botany the Elementary Stage may be taken for the backward students provided that a fair proportion of the students are instructed in the Advanced Stage.

The time-table must also include besides the subjects of Science some such subjects as are indicated in the elementary course or others which are suitable for women.

30. *Where the stage of the subject to be taken is not stated in the Advanced Courses for men and women either the Elementary or the Advanced or the Honours stage may be taught: except in those subjects which form the Elementary Course. In these the Advanced or Honours stage must be taken in the Advanced Course unless where special exceptions are shown.*

31. *The course of instruction for students who have completed one or other of the above courses must be submitted to the Department for approval. It must be in continuation of the course which the student has already followed. But the time devoted to literary subjects and manual instruction may be curtailed to 6 hours per week.*

32. *After the commencement of the school year in* 1897 *Manual Instruction must form part of the Elementary and Advanced Courses for men.*

33. *The payments to Day Organised Science Schools will be made partly on the results of inspection, and partly on examination. They will be as follows:—*

(1.) *An attendance grant of* 1*l.* 10*s. per* 400 *attendances on all students who attend the full course of instruction and*

make not less than 250 *attendances during the school year. The attendance grant will be calculated as follows:—The number of attendances of all students who make not less than* 250 *will be added together and the total will be divided by* 400. *The attendance grant cannot be claimed on account of scholars on the register of a school under the English or Scotch Education Departments, or the Commissioners of National Education, Ireland.*

(2.) *A variable grant on each student of* 35*s.*, 30*s.*, *and* 25*s. The award will be made on the school as a whole and the grant will be calculated on the number* of those students who, having earned the attendance grant, are presented to the Inspector at his annual inspection.† The award will be based on the report by the Inspector of his inspection of the obligatory science, literary, and other subjects of the authorised time-table.*

(3.) *A grant for practical work, which will not exceed in the Elementary course* 30*s. for Physics and* 30*s. for Chemistry on account of each student who earns the variable grant, and which will not exceed* 50*s. for Physics and* 50*s. for Biological subjects on account of each student in the advanced course who earns the variable grant.*

The amount of the grant ‡ will depend on the efficiency (1) *of the laboratory,* (2) *of the equipment, and* (3) *of the practical instruction.*

(4.) *Payments on the results of the examination of the Department in Science—when claimable—will be made on the following scale, and subject to the general conditions applying to the May examinations:—*

(*a.*) 1*l.* 10*s. for a pass in the Elementary Stage of any subject;*

(*b.*) 3*l.*, *and* 1*l.* 10*s. for a first or second class respectively in the Advanced Stage;*

(*c.*) 5*l.*, *and* 2*l.* 10*s. for a first or second class respectively in Honours; except:—*

(*d.*) *in Practical Inorganic and in Practical Organic Chemistry, and in Practical Metallurgy, the payments will be* 2*l. for a pass in the Elementary Stage, and* 4*l. and* 2*l.* 10*s. for a first or second class respectively in the Advanced Stage; and in Mathematics,* 1*l.* 10*s. for a pass in Stage* 1, 2*l. and* 1*l.* 10*s. respectively for a*

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* *In cases of absence of students from the annual inspection owing to illness the Inspector may allow their names to be added to list of those eligible to earn the variable grant.*

† *For the purposes of this award there will be at present a fixed Annual Inspection, which may be supplemented by such visits to the classes in session as will enable the Inspector to estimate the efficiency of the instruction. Should it be found desirable in the future, more than one inspection during the year may be substituted for the fixed annual inspection.*

‡ *Details as to this grant will be given in the Instructions to Inspectors.*

first or second class in Stages 2 *and* 4, 3*l.* *and* 2*l. for a first or second class respectively in Stage* 3, 4*l.* *and* 3*l. for a first or second class respectively in Stages* 5, 6, *and* 7, *and* 4*l.* *and* 3*l. respectively for a first or second class in Honours.*

(5.) *Payments on the results of examinations in the Subjects of Art Group A. (except the Elementary Stage of Freehand) and in Perspective, in an Organised Science School, will be the same as those for Art Schools and Classes at the May examinations (see pars.* 18 *and* 27) *and subject to the same conditions as apply to those payments with the exception that the general attendances of students will suffice to support claims for such payments. In respect, however, of Art Subjects other than those in Group A. and Perspective, attendances must be registered in the ordinary register (Form No.* 486B), *and the teacher of the Organised Science School must be qualified according to the Art rules for such other subjects before payments on results of examination in them according to the May rates, are allowed.*

(6.) *Payments on Manual Instruction will be on the scale laid down in Form* 813, *page* 100, *of the Directory.*

34. *Payments on results on the above scales and subject to the same conditions will also be made on account of students in the advanced and higher courses on the results of the May examinations. But payments will not be made on account of any one student in more than five subjects of Science Instruction.*

35. *The attendance and variable grants are only payable for four years in all on account of any one student.*

36. *No student in the Elementary Course is required to sit at the May examinations, and no payments will be claimable on the results of the examination in May of such student. Any student on whom an attendance grant has been paid will be ineligible to earn payments in the Elementary Stages of the obligatory subjects of the Elementary Course on the results of the May examinations.*

37. *The school year is held to terminate on the* 31*st July for both Day and Night Organised Science Schools.*

38. *In the Organised Science Night Schools the course of instruction must be on the same lines as those prescribed for Organised Science Day Schools, but the teaching of literary subjects is not compulsory. It is not necessary that the student should take within the year all the subjects prescribed in the Day School course. The course for the Organised Night School should, as far as possible, be arranged to carry forward the instruction given in the Evening Continuation Schools of the district.*

39. *An Organised Science Night School may receive—*

(1.) *An attendance grant of* 10*s. per* 60 *attendances on account of each student who attends the full course of Science instruction in at least one Science subject in addition to Mathematics, Drawing, or Geometry, and makes not less than* 40 *attendances during the School year.*

(2.) *A variable grant of* 13*s.*, 10*s.*, *and* 7*s.*, *on each student who having earned the attendance grant is presented for examination by the Inspector in the selected subjects of the year.*

(3.) *Payment for practical work as in* 33 (3).

40. *Payments on results at the May examinations both in the Elementary and Advanced Courses may be claimed on the students of an Organised Science Night School on the same scale as that laid down for the Organised Science Day School. The attendance and variable grants may be earned for three years in each course. Payments are not made in these Night Schools on Manual Instruction.*

Payments cannot be claimed in respect of the same student's attendance at a Day and also at an Evening Organised Science School.

41. *In order that a School may be recognised as an Organised Science School it is necessary*—(1) *that an application be made on Form* 122 *before the 1st August in each year submitting a time-table of the School framed in accordance with the foregoing rules; that such time-table be approved by the Department; and that a copy of it be conspicuously exhibited in the class-room:* (2) *that a special register (Form No.* 486*d*) *be kept, in which not more than two attendances are counted for any one student on any one day, and* (3) *that the requisite hours of instruction per week are allotted to the literary subjects and to the subjects taken under the Science and Art Department.*

42. *The inspection of the Organised Day Science Schools will be conducted by one or more Inspectors of the Department between the beginning of May and the end of July, and of the Evening Schools somewhat earlier in the School year. Three weeks notice of the date of inspection will be given. The mode of examination will be at the option of the Inspector and may be either partly or entirely vivâ voce, or by papers.*

43. *The co-operation of one of H.M. Inspectors of Schools may be requested in the examination of the literary subjects, or if provision is made for examination in these subjects by some public examining body for that particular School, the report of that examining body, if submitted, may be considered if the Department so decide in awarding the grant.*

44. *Reasonable latitude will be allowed for two years while the change is being made from the present to the new system.*

45. *If the Organised Science School be an Endowed School the grants to it will be liable to reduction under Section 20, p. 32, ante.*

REWARDS TO STUDENTS.

Cards. Prize certificates.

46. A candidate who passes in any one of the stages of a Science subject receives a card or certificate recording his success in the examination unless he has previously obtained the same or a higher class in that subject.

Candidates in Honours in Chemistry or Metallurgy must pass in both the theoretical and practical examination, but not necessarily in the same year, before receiving a Certificate.

Queen's Prizes.

47. A small number of Queen's prizes of books, instruments, &c. are given to those who do best in the Advanced Stage of each subject, or in the second or any higher stage of mathematics,* provided that they are registered students in a school under the Department, and have received from a qualified teacher at least 20 lessons within the two preceding years in the subject in which a prize is claimed.

No student can receive a Queen's prize, except in Mathematics, unless he has previously passed in the elementary stage of the same subject.

Bronze Medals.

48. Bronze Medals are given to all candidates who obtain a first class in Honours.

Candidates in Honours in Chemistry or Metallurgy must obtain a first class in both the theoretical and practical examination, but not necessarily in the same year, before receiving a certificate or medal.

Candidates not eligible for prizes.

49. The following are not eligible for prizes :—

a. Students who have previously received one of these Queen's prizes for the same, or a higher class, in the same subject;

b. Teachers earning, or who have earned, payments under the Department;

c. Persons who are, or have been, students of the Queen's Colleges in Ireland, the Royal College of Science in London, the Royal College of Science in Dublin, the Royal Dockyard Schools, or of any other institutions receiving State aid in those subjects which are taught as a portion of the regular course in those Institutions.

Royal National Scholarships, and Free Studentships.

50. ROYAL EXHIBITIONS, NATIONAL SCHOLARSHIPS, and FREE STUDENTSHIPS.—The following are awarded in competition at the annual May Science examinations of the Department :—

Royal Exhibitions.

Twelve Royal Exhibitions—four open each year—to the Royal College of Science, London.

Nine Royal Exhibitions—three open each year—to the Royal College of Science, Dublin.

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* Local Committees must make their own arrangements for obtaining the prizes. The Special Certificate on Form No. 161 should be completed and forwarded. The Department will then pay to the Local Committee the sum of 2*l.* for each prize gained, and furnish one prize label for each prize-winner; and the Committee must undertake to procure books or instruments for their students to the value of at least 2*l.* for each prize.

Sixty-six National Scholarships—twenty-two open each year—tenable at the option of the holder at either the Royal College of Science, London, or the Royal College of Science, Dublin. National Scholarships.

Eighteen Free Studentships—six open each year—to the Royal College of Science, London. Free Studentships.

A candidate who has held a Royal Exhibition, a National Scholarship, or a Free Studentship, is ineligible to compete for either of the other two. Restrictions.

A ROYAL EXHIBITION entitles the holder to free admission to lectures and laboratories and to instruction during the course for the Associateship—about three years—in the Royal College of Science, London, or the Royal College of Science, Dublin, with a maintenance allowance of 50*l.* a year. Value of Royal Exhibitions.

A NATIONAL SCHOLARSHIP entitles the holder to free admission to lectures and laboratories and to instruction during the course for the Associateship, about three years, at either the Royal College of Science, London, or the Royal College of Science, Dublin, at the option of the holder, with a maintenance allowance of 30*s.* a week for the session of about forty weeks each year, and Third class railway fare for one journey to and fro, each session, between the home of the scholar and London or Dublin, as the case may be. Value of National Scholarships.

Changes in the method of awarding the National Scholarships are in contemplation. These changes will not take effect until the session 1896–1897 and due intimation of their nature will be given.

A FREE STUDENTSHIP entitles the holder to free admission to the lectures and laboratories and to instruction during the course for the Associateship, about three years, in the Royal College of Science, London, but not to any maintenance or travelling allowance. Value of Free Studentships.

The Royal Exhibitions and Free Studentships are open to all British subjects. Conditions of tenure of Exhibitions.

The National Scholarships are only open to British subjects who belong to one of the categories (*a*), (*b*), (*c*), (*d*), (*e*) of § XXXII., sec. iii. Scholarships and Free Studentships.

All the Exhibitions, Scholarships, and Studentships are held on the condition that the holder attends the courses of instruction regularly, complies with all the rules laid down for his guidance, and passes the examinations required for the associateship.

Private students who have been for more than one session in the Royal College of Science, London or Dublin, Local Exhibi-

tioners, and Science teachers in training, are not eligible for Royal Exhibitions, National Scholarships, or Free Studentships.

Competitors for Royal Exhibitions, National Scholarships, or Free Studentships must send in Form No. 330*a* before the 15th April, and Form No. 400 before the 10th June.

Calculation of results in the competition for Royal Exhibitions, &c.

51. The competition for the Royal Exhibitions, the Free Studentships, and for half of the National Scholarships, is determined as follows :—

The maximum number of marks obtainable in each subject, except Mathematics, is in the

Elementary stage - - -	100
Advanced stage - - -	200
Honours - - -	400

with half the above maximum marks for practical Chemistry or practical Metallurgy or the practical Honours Examinations specified in sec. 10, p. 29, in addition to those for the Theoretical division of the same subject.

In Mathematics the numbers are in the

1st stage - -	100	
2nd „ - -	200	
3rd „ - -	300	Honours 500
4th „ - -	150	
5th „ - -	300	Honours 500
6th „ - -	300	
7th „ - -	400	Honours 600

But the number of marks gained by the candidate in each subject in the elementary stage (or in the 1st stage in Mathematics) is diminished by 50 per cent., and the number of marks gained in the Advanced Stage by 40 per cent., and in Honours by 30 per cent. of the total marks obtainable in the respective stages.

The remainder are then added together to determine the candidate's position.

But no candidate is awarded a Royal Exhibition, National Scholarship, or Free Studentship who has not obtained in Mathematics at least 60 per cent. of the total number of marks obtainable in the 1st stage or a second class in some higher stage or in Honours. This success may have been obtained in a previous year, but no marks are counted except for successes obtained in the current year.

The competition for the moiety of the National Scholarships excepted from the preceding rules will be decided by giving five scholarships each year to the Candidates who obtain the highest aggregate marks in Physics and Chemistry (Subjects 8, 9, 10 10*p*, 11, and 11*p*); four to the Candidates who obtain the highest aggregate in Mechanics (Subjects 1, 2, 6, 7, and 22); and two to the Candidates who obtain the highest aggregate in Human Physiology, General Biology, Zoology, and Botany (Subjects 14, 15,

16, and 17) : provided that they have obtained, in the current or in some previous year, at least a pass in the elementary stages of one division of Theoretical Mechanics (Subject 6*a* or *b*), of Physics (Subjects 8 and 9, or Alternative Physics), Chemistry (Subject 10*p* and in 10, or Alternative Chemistry), and Mathematics, Stage 1.

Whitworth Exhibitions and Scholarships.

WHITWORTH SCHOLARSHIPS.—Sir Joseph Whitworth's Exhibitions and Scholarships are also awarded in competition at the May examinations. Candidates for Whitworth Exhibitions and Scholarships must register their names as competitors by sending in Form No. 330 before 15th April, and send in Form No. 400 before the 10th June. Further details with regard to these Scholarships will be found in the Whitworth Prospectus, which may be obtained from the Department, price 5*d*. [*See* No. 453 in list of publications at end of Directory.]

GRANTS AND PRIVILEGES ALLOWED TO TEACHERS.

Summer courses for teachers.

52. Arrangements are made to enable a certain number of Science teachers to attend courses of instruction in Science in the Royal College of Science at South Kensington, in the month of July. The teachers selected to attend any of these courses receive Third Class railway fare and 3*l*. towards their expenses while attending the College on condition that they comply with the rules. In the case of teachers resident in London or its vicinity a reduction is made in the personal allowance.

Information as to the precise period of these courses is circulated to Science Schools about April.

Studentships in Training at South Kensington.

53. A limited number of Teachers, and of Students in Science Classes who intend to become Science Teachers, are admitted free to the sessional courses of instruction in the Royal College of Science. They receive a maintenance allowance of 21*s*. per week while under instruction, and third class railway fare for one journey to and fro each session between the home of the teacher or student and the Royal College of Science. In certain special cases the allowance to Science Teachers in training may be increased to a sum not exceeding 30*s*.

Candidates for these Studentships in Training must send in Form No. 400 before the 10th June, and Form No. 1019 before the 1st July. The condensed prospectus of the Royal College of Science will be found at p. 41. [*See* also No. 295–6 in list of publications at end of Directory.]

Science Teachers who are sent abroad, or who travel in the service of the Department, receive 10*s*. a night while absent from home, second class railway fare, and cab or omnibus fares.

Assisted Studentships at Provincial Colleges.

54. Aid is granted to a limited number of teachers engaged in science teaching who are selected to attend instruction at Provincial Science Colleges. Particulars of the courses of instruction and of the nature and conditions of the Department's assistance are given for the Owen's College, Manchester, in Form

No. 988; for the Mason Science College, Birmingham, in Form No. 1126; for the Firth College, Sheffield, in Form No. 1136; for the Yorkshire College, Leeds, in Form No. 1165; for the University College, Dundee, in Form No. 1193; for the University College, Nottingham, in Form No. 1195; for the University College, Cardiff, in Form No. 1243; for University College, Bristol, in Form No. 722; for the University of Aberdeen in Form No. 487; for the Durham College of Science, Newcastle-on-Tyne, in Form No. 484; University College of Wales, Aberystwith, in Form No. 826; St. Andrew's College, in Form No. 226; and for University College of North Wales, Bangor, in Form No. 963.

Application to attend the Mason Science College or University College, Nottingham, must be made on Form No. 985. Application to attend any of the other Colleges on Form No. 985*b*. No application received later than 20th August will be considered. The selection of the applicants rests with the Department.

When an application is granted the applicant will receive Form No. 997 and is required to give the undertaking on Form No. 996.

Visits of classes to Museum.

55. Facilities will be given to Science teachers bringing their students to the South Kensington Museum, to examine the collections. When a teacher desires to avail himself of this privilege the Secretary of his school should write to the Department at least one week prior to the intended visit, stating the number of students by whom the teacher will be accompanied, the proposed date and hour of the visit, and the collection of apparatus which it is desired to inspect. The apparatus is available for inspection from 10 a.m. to 4, 5, or 6 p.m., according to the time of the year Apparatus cannot be inspected in the evening or on a Bank Holiday.

Admission of Science Teachers to Lectures.

56. Any *bonâ fide* Teacher who is qualified to earn payments on results, and who is actually engaged in teaching, or who has recently taught approved Science classes under the Department, may attend, without the payment of any fee, any course of lectures at the Royal College of Science, London; or at the Royal College of Science, Dublin, as far as there may be room. Application for this privilege should be made to the Registrar, Royal College of Science, London, or to the Secretary of the Royal College of Science, Dublin.

NOTE.—Science Form No. 170 (see page 104) gives specific instructions as to the dates for making returns, &c. Special attention is called to these and to the concluding paragraph.

Application for any of the forms alluded to in this Directory should be made to the Secretary, Department of Science and Art, London, S.W.

Official communications should be written upon foolscap paper and sent in envelopes addressed to the Secretary, Department of Science and Art, London, S.W. The postage need not be prepaid, and it is particularly requested that Post Cards and Correspondence Cards may not be used.

The Royal College of Science, London.*

Object of the Royal College of Science.

1. The Royal College of Science at South Kensington is an institution supported by the State to supply systematic instruction in the various branches of Physical Science to students of all classes. While the College is primarily intended for the instruction of Teachers, and of students of the industrial classes selected by competition in the examinations of the Department of Science and Art, other students are admitted so far as there may be accommodation for them (*see* p. 47, sec. 10), on the payment of fees fixed at a scale sufficiently high to prevent undue competition with institutions which do not receive State aid.

Royal School of Mines.

2. The Royal School of Mines is incorporated with the Royal College of Science. Students entering for the Associateship of the School of Mines obtain their general scientific training in the Royal College of Science.

Administration of the Royal College.

3. The Royal College of Science is administered by a Council consisting of the Professors, with a Dean as Chairman, and a Registrar.

Course of instruction.

4. The instruction in the Royal College of Science is arranged in such a manner as to give the students a thorough training in the general principles of Science, followed by advanced instruction in one or more special branches of Science.

Associateship students.

5. The Associateship is granted in certain divisions or lines of study. Students who go through any one of these divisions taking the subjects of instruction in the prescribed order and who pass the necessary Examinations receive a Certificate of Associateship of the Royal College of Science, or of the Royal School of Mines.

Other students.

6. Students who are not candidates for the Associateship are permitted to enter as occasional students, and to take up the course of instruction in one or more special branches of Science, and on passing the examinations receive a Certificate to that effect. Certificates are not given for Model and Freehand Drawing, nor for Mathematics, except in the higher classes, namely, C, D, and E.

Royal College of Science Associateship.

7. The Associateship of the Royal College of Science is given in one or more of the following divisions—

I. Mechanics.
II. Physics.
III. Chemistry.
IV. Biology
V. Geology.
VI. Agriculture,

Royal School of Mines Associateship.

and the Associateship of the Royal School of Mines in—

VII. Metallurgy.
VIII. Mining.

* The title was changed from "Normal School of Science" on the 25th October, 1890.

Division of the three year course.

8. The course of instruction, which lasts for three years, is the same for all the divisions during the first year, after which it is specialised in accordance with the Scheme given below, where the fee for each section of the course is also stated.

9. A student obtains the Associateship who passes in all the subjects of the first two years and in the third year those of the special division he selects for his Associateship.

The obligation to go through the Elementary, or First Part in any of the following courses, may be remitted in the case of any Student who satisfies the Council that he has received sufficient theoretical and practical instruction in those subjects.

Students who have failed to satisfy the examiners at the end of their period of study in an Elementary class, will not be allowed to enter the Advanced Course in the same subject until they have passed the Elementary Examination.

ASSOCIATESHIP COURSE.

1ST YEAR.

First Term.	Second Term.
Chemistry (Part I.) 16*l.*	Physics (Part I.) 17*l.*
	Astronomical Physics, 5*l.*

Mathematics (3*l.* per Term) and Freehand and Model Drawing (1*l.* per Term) throughout each Term.

2ND YEAR.

First Term.	Second Term.
A. Mechanics 10*l.* and Machine Drawing (Part I.) 3*l.*	Elementary Geology and Mineralogy 12*l.*
B. Elementary Biology 17*l.*	

A. For Students who take the Associateship in Divisions I., II., III., VII., or VIII.

B. For those who take the Associateship in Divisions IV., V., VI.

Instruction in Mathematics 3*l.* per Term, so far as may be necessary, and in Descriptive Geometry throughout both Terms 3*l.* for the Session.

NOTE.—Descriptive Geometry is an optional subject for those students who take B.

3RD YEAR.

I. MECHANICS.

First Term.	Second Term.
Mechanics (Part II.) 8*l.*	Mechanics (Part III.) 8*l.*
Mathematics 3*l.*	Mathematics 3*l.*
Machine Drawing 3*l.*	Machine Drawing 3*l.*

II. PHYSICS.

Physics (Part II.) 12*l.*	Physics (Part III.) 12*l*

III. CHEMISTRY.

First Term.	Second Term.
Chemistry (Part II.) 16*l.*	Chemistry (Part III.) 16*l.*

IV. Biology.

Zoology (Part II.) 12*l.*	Zoology (Part II.) 12*l.*
Botany (Part III.) 12*l.*	Botany (Part III.) 12*l.*

V. Geology.

Geology (Part II.) 8*l.*	Geology (Part III.) 8*l.*

VI. Agriculture.

Mechanics (Part I.) 10*l.*	Agricultural Chemistry 13*l.*
Principles of Agriculture 4*l.*	

VII. Metallurgy.

Metallurgy lectures (Part I.) 2*l.*	Metallurgy lectures (Part II.) 2*l.*
Assaying, with determinative Mineralogy 13*l.*	Assaying 13*l.*

VIII. Mining.

Mining lectures 4*l.*	Mining lectures.
Metallurgy (Part I.) 2*l.*	
Assaying, with determinative Mineralogy, 13*l.*	Mine Surveying, 10*l.*

No student can take the double Associateship in Mining and Metallurgy in the same year unless he satisfies the Council at the commencement of the third year's session that his previous training in one or both of those subjects is such as to warrant a departure from the ordinary rule.

No candidate for the Associateship will be allowed to enter a Third Year's Course, unless he has passed the examination in at least three of the preliminary subjects of the first two years, viz.:—Chemistry, Physics, Mechanics or Biology, and Geology, nor unless he has acquired the amount of Mathematical knowledge essential in the opinion of the Professor in charge of the class he proposes to attend.

Admission of Students.

10. Application for admission must be made on Form 1289, and be sent to the Registrar before the end of May for admission in the first term in October, or before the end of December for admission in the second term in February. In this form a statement should be given of the studies which the applicant has already pursued, the examinations he has passed and the names of a teacher or teachers to whom reference may be made. This application will be considered by the Dean and Council of the College, who will decide whether or not the candidate can be admitted.

This paragraph applies to private, *i.e.*, fee-paying students only. The regulations as to the admission of State-aided students are contained in paragraphs 24 to 32.

Form 1289 can be obtained on application to the Registrar.

Conditions of admission of private students to the College.

11. Without some preliminary knowledge of Mathematics, Mechanics, Chemistry, and Physics it is not possible for Students to follow the courses with advantage. No fee-paying Student will, except under very special circumstances, be entered for the Associateship Course unless he has obtained a pass in the Elementary Stage of Mathematics, Mechanics, Chemistry, and Physics, or in some higher stage of those subjects, at the May Examinations of the Department of Science and Art, or can show to the satisfaction of the Council of the College, by having passed the Examinations of other recognised Institutions or examining bodies, that he possesses the necessary elementary knowledge of those subjects, while for occasional students who desire only to take up certain specific branches of Science some preliminary knowledge of Mathematics will be required.

Lectures.

12. Admission is granted to persons desirous of attending certain courses of the lectures, without the laboratory instruction, on payment of the lecture fees.

Laboratory fees.

13. Students who do not wish to attend the lectures are admitted for short periods to the laboratories, at the discretion of the Professors. The fees for the laboratories are 4*l.* per month.

Persons admitted at half fees.

14. Officers of the Army, Navy, and Civil Service, recommended by their respective Departments, are admitted to the Lectures and Laboratories at half fees.

Rules for admission of teachers.

15. *Bonâ fide* teachers qualified to earn payments for teaching Science according to the rule of the Science and Art Directory, and who are actually engaged in teaching, may obtain permission to attend free any course of lectures.

Privileges of associates.

16. Associates of the Royal College of Science or of the Royal School of Mines have the privilege of free admission to the Library and to all the courses of lectures.

Division of session.

17. The Session is divided into two Terms. The first Term begins on the 3rd October and ends about the middle of February. The second Term begins in the middle of February and ends about the middle of June. The Christmas and Easter Holidays each last about *fourteen* days.

Holidays.

Hours of study.

18. The hours of study are from 10 a.m. to 1.15 and from 2 to 4 p.m. every day, except on Wednesday and Saturday, when the College closes at 1 p.m.; students receiving instruction in Mathematics attend till 5 p.m. on the specified days.

Extracts from regulations to be observed by students.

Both the private and the State-aided students are required to furnish themselves with certain instruments and apparatus before the commencement of the courses. These are enumerated in the syllabuses of the several subjects.

Every Student will be required to conform to the rules of the College, to exhibit due diligence in his studies throughout the courses, and to give evidence of satisfactory progress at the different examinations, failing which, or in the event of misconduct, he will not be allowed to remain at the College.

Fees.

19. The Fees of Students entering for the Associateship are given, for greater convenience, at page 42, from which it will be seen that for the first two years they amount to about 75*l.*, and for the remainder of the course for the Associateship they vary from 30*l.* to about 40*l.* Students not entering for the Associateship are admitted to any particular course of study, so far as there is room, on payment of the fees, as shown in the following table:— Fees.

Chemistry, Inorganic, Lectures, 3*l.*
„ Organic, Lectures, 3*l.*
„ Laboratories, per term, 13*l.*
Physics, Elementary, Lectures, 5*l.*
„ Laboratories, per term, 12*l.*
Biology, including Botany, Lectures, 5*l.*
„ Laboratories, per term, 12*l.*
Geology, including Mineralogy, Lectures, 4*l.*
„ Laboratories, per term, 8*l.*
Mechanics, Lectures, 4*l.*
„ Elementary Class Work, per term, 6*l.*
„ Advanced, 8*l.*
Metallurgy, Lectures, per term, 2*l.*
„ Laboratories, per term, 13*l.*
Principles of Mining, Lectures, 4*l.*
Mine Surveying, 10*l.*
Principles of Agriculture, Lectures, 4*l.*
Agricultural Chemistry, per term, 10*l.*
Astronomical Physics, Lectures, 2*l.*
Astronomical Physics, Laboratories, 3*l.*
Descriptive Geometry, 3*l.* per session.
Mathematics and Machine Drawing, 3*l.* each per term.
Model and Freehand Drawing, 1*l.* per term.
N.B.—In all cases fees must be paid in advance.

Examinations.

20. Examinations are held at the end of each course of instruction and at such other periods as may be found necessary. These examinations will be conducted by the Professors conjointly with examiners appointed by the Department of Science and Art. On the results of these examinations the successful candidates who have attended regularly and otherwise conformed to the rules of the college are arranged in two classes, first and second. Examinations.

SCALE OF MARKS AUTHORISED FOR THE EXAMINATIONS IN THE SUBJECTS OF THE FIRST TWO YEARS.

Mathematics	Class A.	10
	„ B.	15
	„ C.	30
	„ D.	45
		100

1ST YEAR.

First Term.		Second Term.	
Chemistry (Part I.)	100	Physics (Part I.)	90
Mathematics, according to scale.		Astronomical Physics	10
		Mathematics, according to scale.	

Model and Freehand Drawing - 10

2ND YEAR.

First Term.		Second Term.	
A. Mechanics and Machine Drawing (Part I.)	100	Geology, Elementary	70
		Mineralogy	30
		Mathematics, according to scale.	
B. Elementary Biology	100		
Mathematics, according to scale.			

Descriptive Geometry - 20

21. There are also "Honours" examinations for the subjects of the third year, the successful candidates being placed in order of merit.

"Honours" are only obtainable by candidates for the Associateship. No one will be allowed to attempt the Honours examination who fails to obtain a 1st Class in the ordinary examination.

The candidate for Honours will be required to pass an examination in some special branch or branches of one of the subjects in which the Associateship can be taken. The papers set will be of a more advanced character than those in the ordinary Associateship Examination.

The candidate will also be required to present a Thesis on some special subject, and great weight will be given to the adequate description of any original work or research which has been carried out by the student in one of the laboratories of the college with the sanction of the Professor.

For the Honours Examination in certain divisions the subjects will be as follows, and the student will only be required to take up one of them :—

Division II.—Physics.	Division III.—Chemistry.
Sound and Light.	Inorganic Chemistry.
Heat.	Organic Chemistry.
Electricity and Magnetism.	Chemical Physics.
Chemical Physics.	

The examination in Chemical Physics will be held jointly by the Professors of Chemistry and Physics.

Division IV.—Biology.

Zoology.	Botany.
Anatomy and Histology	Physiology of Plants.
Development.	Anatomy and Histology.
Vertebrate Palæontology.	Morphology in relation to Classification.

Division V.—Geology.

Petrology.	Stratigraphical Geology
Invertebrate Palæontology.	

Division VII.—Metallurgy.

Researches connected with the practical examination of a Metallurgical process or details of a process.
Theoretical Metallurgy.

Division VIII.—Mining.

Geological and technical description of some mine or mining district from personal study, with full details.

Re-examination.

22. Students may be re-examined on payment of a fee of 1*l.* for each subject.

Certificates.

23. A student who goes through the prescribed course of instruction in any subject and passes the final examination in it receives a certificate to that effect as an occasional student.

Royal Exhibitions, National Scholarships, and Free Studentships.

24 to 30. (See Science secs. 50 and 51.)

Teachers in Training.

31. (See Science sec. 53.)

Local Exhibitions.

32. (See §§ XXXV. and XXXVIII.)

REWARDS TO STUDENTS.

Royal Scholarships.

Royal Scholarships.

33. Four Scholarships, of 15*l.* each, are given to the students who have gained the greatest aggregate of marks in the examinations of the first year; and two Scholarships of 25*l.* to those pupils who have gained the greatest aggregate of marks in the examinations of the first two years.

These Scholarships are held on the condition that the student attends the courses of instruction regularly, is examined, and passes satisfactorily.

The Scholar receives one moiety of his Scholarship at the commencement of the Session, and the balance at its conclusion, if the conditions have been satisfied.

Teaching Scholarships in Chemistry.

Teaching Scholarships in Chemistry.

34. Two scholarships of 50*l.*, each tenable for one year only will be awarded to two students in the Chemistry classes who take a high place in the final examinations of the Session, and who are otherwise, in the opinion of the Council, well qualified.

The holders of these Scholarships will be required to teach in the Chemical Laboratories during the ensuing Session.

The Edward Forbes Medal and Prize.

Forbes medal and prize.

35. The Trustees of the Edward Forbes Memorial Fund present a bronze medal and a prize of books, to be awarded to the student who does best in Biology.

The Murchison Medal and Prize.

Murchison medal and prize

36. This medal and prize of books, the gift of the late Sir Roderick Murchison, is awarded annually to the student who does best in Geology.

The Tyndall Prize.

Tyndall prize.

37. The late Professor Tyndall having presented a sum of 100*l.*, the interest of which is to be given as a prize, books to that value are awarded to the student who does best in Physics, Part I.

The De la Beche Medal.

De la Beche medal.

38. This bronze medal, established in memory of Sir Henry De la Beche, is awarded annually to the student who does best in Mining.

The Bessemer Medal and Prize.

Bessemer medal and prize

39. A bronze medal and a prize of books to the value of 5*l.*, given by Sir Henry Bessemer, are awarded annually to the student who does best in Metallurgy.

The Frank Hatton Prize.

Hatton prize.

40. A prize in memory of the late Frank Hatton, a student of this College, will be given to the student who does best in Chemistry.

The Warington Smyth Medal and Prize.

41. A silver gilt medal, and the balance of the proceeds of a fund established in memory of Sir Warington Smyth, are

awarded annually to the student who takes the first place in the Honours examination in Mining.

The award is only made if the Professors of Mining and Geology consider the candidate to have shown sufficient merit.

The Huxley Laboratory for Biological Research, and the Marshall Scholarship.

42. The research laboratory, which was founded to commemorate the long connexion of Professor Huxley with the School of Mines and the Royal College of Science, and is supplied with a valuable library given by him to the institution, is capable of accommodating two students. The occupants of this laboratory are required to undertake some branch of original research in Biology (Zoology, Botany, or Palæontology), under the superintendence of the professors and assistant professors in the Biological and Geological Divisions.

The Marshall Scholarship, which was founded by Miss Sarah Marshall in honour of her father, the late Mr. Mathew Marshall, of the Bank of England, is awarded annually to a student engaged in biological research in the Huxley Laboratory. The funds for this scholarship are supplied from the interest of about 900*l.* left by Miss Marshall for its endowment.

Prizes given by the Department of Science and Art.

43. Prizes of books, each of the value of 3*l.*, are awarded by the Department of Science and Art to the students who do best in the following subjects:—Mechanics, Astronomical Physics, Practical Chemistry, Principles of Mining, Principles of Agriculture, and Agricultural Chemistry. Department prizes.

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44. It rests with the Council to determine which of the candidates for the foregoing medals and prizes has done best. No candidate is allowed to compete for the same prize more than once.

Summer Courses for Teachers.

See Science sec. 52, page 43. Summer courses.

Working Men's Lectures.

46. Notification of these will be given in the newspapers. Working men's lectures.

For any further information apply to the Registrar, Royal College of Science, South Kensington, London, S.W.

GENERAL TIME TABLE OF SUBJECTS FOR THE SESSION 1894–1895.

When the Course consists of two or more parts these are indicated by the Roman Numerals I., II., or III., otherwise a × is put under the months.

—	Oct.	Nov.	Dec.	Jan.	Feb.		Mar.	April.	May.	June.
Chemistry	I. II.	I. II.	I. II.	I. II.	I. II.	III.	III.	III.	III.	III.
Physics	I. II.	I. II.	I. II.	I. II.	I. II.	I. III.	I. III.	I. III.	I. III.	I. III.
Biology	I. II. & III.	I. II. & III.	I. II. & III.	I. II. & III.	I. II. & III.	II. III.	II. III.	II. III.	II. III.	II. III.
Geology (including Mineralogy)	II.	II.	II.	II.	II.	I. III.	I. III.	I. III.	I. III.	I. III.
Astronomical Physics										×
Mathematics	×	×	×	×	×	×	×	×	×	×
Descriptive Geometry	×	×	×	×	×	×	×	×	×	×
Mechanics and Machine Drawing	I. II.	I. II.	I. II.	I. II.	I. II.	III.	III.	III.	III.	III.
Metallurgy, with Assaying.	×	×	×	×	×	×	×	×	×	×
Principles of Mining	×	×	×	×	×	×	×	×		
Mine Surveying						×	×	×	×	×
Principles of Agriculture.	×	×	×	×						

The hours of study for all subjects except Mathematics and Drawing are from 10 to 1.15 and from 2 to 4 daily, except on Wednesday and Saturday, when they are from 10 to 1 only. Mathematics will be taught from 3 to 5 daily, except on Wednesdays and Saturdays. Model and Freehand drawing are taken during the 1st session, and Descriptive Geometry during the 2nd session, from 10 a.m. to 1 p.m. on Saturdays. The session opens 3rd October 1894.

Rules for Science Classes in Training Colleges under the English and Scotch Education Departments.

Examinations.

1. *The ordinary May Examinations*, in certain branches of Science will be held in Training Colleges. All payments for instruction in Science in Training Colleges are made on the results of this Examination.

2. The Examination is for the students in the Training Colleges and is not open to Acting Teachers. It is held in those subjects only for which a special course of instruction is provided in the time-table of the College, and is conducted by one of Her Majesty's Inspectors, or by an officer of the Department of Science and Art. No Student in a Training College is allowed to attend the May Examinations of the Department of Science and Art *at a centre other than his own College.*

Local Committees are not required for the Training Colleges; such returns as are necessary being made by the Principal. Separate registers of students' attendance at Science instruction need not be kept. Before 1*st November* in each year the Principal should furnish on Form No. 120A particulars of the Teaching Staff and Time Table of Instruction under the Department of Science and Art. *Changes which are made subsequent to this return should be reported to the Department.*

Application for examination papers must be made in Form No. 119 in accordance with paragraph XXVII., p. 11.

Subjects of examination.

3. The Examination is confined to the following subjects of Science:—

1. Practical Plane and Solid Geometry (Elementary Stage). Subject I.
2. Mathematics. Subject V. *Stages 5, 6, and 7.**
3. Theoretical Mechanics; (*a*) solids; (*b*) fluids. Subject VI.
4. Applied Mechanics. Subject VII.
5. Sound, Light, and Heat (Elementary Stage), and, in the Advanced Stage or Honours, (*a*) Sound, (*b*) Light, (*c*) Heat. Subject VIII.
6. Magnetism and Electricity. Subject IX.
   Alternative Elementary Physics.† (Alternative to Subjects VIII. or IX.)
7. Inorganic Chemistry (Theoretical), Inorganic Chemistry (Practical). Subjects X. and X.*p.*

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* *No student will be allowed to sit in more than one stage of Mathematics in the same year.*

† *No student will be allowed to sit in Subject VIII. or in Subject IX. and also in Alternative Elementary Physics.*

8. Human Physiology. Subject XIV.
9. Botany. Subject XVII.
10. Physiography. Subject XXIII.
11. Principles of Agriculture. Subject XXIV.
12. Hygiene. Subject XXV.

4. The course of instruction in each subject is intended to cover two years in the Training College unless the student has previously studied the subject. No student is allowed to attempt the paper for the Advanced Stage or for Honours, in any subject other than Mathematics, unless he has previously been successful, at the May Examination or at the Training College, in at least the Elementary Stage of the subject, or has been recorded "Fair" at Examination in the Elementary Stage. *A student who passes in the Elementary Stage of a subject of Science in one year must take the Advanced Stage of that subject in the following year.* No student is permitted to take up more than two subjects of Science, in addition to the Elementary Stage of Science Subject I., *unless they are taken in substitution for certain subjects which are specified in the Syllabus of the Education Department. To this syllabus reference should be made for particulars as well as for the conditions under which marks for success at the Science Examinations may be counted in the Certificate examination.*

In the interpretation of this rule, limiting the number of subjects of Science to be taken up, Division *a* or *b* of VI., and Division *a*, *b*, or *c*, of the Advanced Stage of VIII. is each considered a separate subject.

Instruction in Chemistry.

5. Practical instruction must in all cases form a part of the teaching of Chemistry in Training Colleges. No grants are made to any College on the results of examination in Chemistry unless it be furnished with a Laboratory and Apparatus satisfying the requirements detailed at p. 204; and it is necessary that each student, on whom payment is to be claimed, should himself perform, previous to his examination, the more important and characteristic of the experiments.

6. The Examination is based on the syllabus of the several subjects (pp. 148, 159, 164, 168, 170, 189, 216, 226, 250, 252, 260); and papers are set in the three stages, Elementary, Advanced, and Honours, at the May Examination. Questions are also set on the method of teaching various branches of the subject.

7. The successful students are classed as at the May Examinations (*see* p. 26).

Certificates.

8. All students who pass receive certificates, but no prizes are given. The students who obtain a First Class in the Advanced paper or pass in Honours are registered as qualified to earn payments on results.

9. The payments are 2*l.* for a pass in the Elementary Stage of any subject; for a first or second class in the Advanced Stage 3*l.* and 1*l.* 10*s.* respectively; and for a first class or second class in Honours 5*l.* and 2*l.* 10*s.* respectively. These are subject to the same deductions (except in the case of Mathematics, in which the deductions are stated below, *see* § 13), as those made on the results of the May Examinations, viz. :—

No payment is made on account of a student who has been previously successful in a higher stage of the same subject. If the student has been previously successful in the same stage of the same subject, either at a Training College Examination or at the May Examinations, the payment on his account will be reduced by the payment which would be claimable on such previous success.

For instance, the payment of 3*l.* for a first class in the advanced stage would, if the student had previously taken a second class in that stage of the same subject, be reduced by 1*l.* 10*s.*

No deduction is made in the payment for the first stage of Subject I. on account of a previous payment for section 1 of that subject.

10. In addition to the payments for Theoretical Chemistry, payments are made for Practical Chemistry of the same amounts and on the same conditions as those detailed for the May Examinations in sec. 14, p. 30. Mathematics Syllabus.

11. The examinations in the year 1896 will be held in *April, May, and June* (*see Examination Time-Table, p. 27*).

12. One Stage of Mathematics may be taken each year; but, except in Honours, two Stages may not be taken in the same year. Payments of 3l. and 1l. 10s. are made in each Stage for a First and Second Class respectively, and of 5l. and 2l. 10s. for a First and Second Class in Honours respectively.

13. In Mathematics the reductions on account of previous success at the May Examinations will be 10*s.* for 2nd Stage, 1*l.* for 3rd Stage, 10*s.* for 4th Stage, and 1*l.* for 5th, *6th, or 7th* Stages.

No payment will be made on account of successes at the May Examinations in the Elementary or Advanced Stage of any subjects of Science obtained by Candidates who were successful at the Training College Science Examinations between the years 1878 and 1887 inclusive, or at those examinations held under the "old" rules in 1888 or 1889. The usual payment will, however, be made for success in Honours.

As regards Mathematics, Candidates who have passed under the former Training College rules or under Stage 1 of the *late* rules will only be paid on in Stage 5, Honours of Stages 4 and 5, Stage 6, Stage 7, and Honours of Stages 6 and 7 at the May Examinations. Candidates who have passed Stage 2 of

the *late* Training College rules will not be paid upon for success at the May Examinations.

Where a Committee for the supervision of Science Classes in the building of a Day Training College has been recognised by the Department, the Day Training College Students will not be considered as forming part of those Classes, but will be treated separately as regards payments and returns.

Training Colleges in Ireland.

Training Colleges in Ireland.

Students of Training Colleges in Ireland may be examined and earn payments on results in Science Subjects, provided that the Authorities of each College examined employ a duly qualified Teacher.

In place of a Local Committee the College Authorities must supervise the Science instruction and make the necessary arrangements for the examinations under the rules for the May examinations. The Principal, who will act as Secretary, must *make a return of the subjects taught, the teaching staff, &c. on Form No. 120* (*see page 105*) *and must* make application for papers in Form No. 119 in accordance with § XXVII. (*see* page 11). The examinations will be conducted by an officer of the Department. Payments on results and the conditions attaching to such payments are the same as those which are stated in pars. 9 and 10 (*see* above). *The College will not have to keep separate registers of students' attendance at Science instruction.*

Form 1234.
S.

Special Regulations applying to Science Schools, Teachers, and Pupils in Ireland.

Formation of Science Schools.

1. When it is proposed to commence a Science School or Class in Ireland, Form No. 1104 should be *at once* forwarded to the Department of Science and Art by the gentleman who is to act as Secretary of the Local Committee, giving full particulars as to the place where the class is to be held, how the Local Committee will be constituted, the name of the teacher, and the subjects to be taught.

Unless Form No. 1104 be received before the 1st September, the Department may refuse to make payments on the results of the next examination. The acceptance of the form after that date is exceptional, and will be subject to a deduction from the grant.

2. No person teaching in a School under the Commissioners of National Education will be recognised as a teacher under the Department of Science and Art at any other School without special sanction.

Continuance of Science School.

3. When it is proposed to continue an existing Science School, each teacher of that School should forward Form No. 1160 to the Department of Science and Art. Unless this form be sent to the Department by a teacher before the 1st September, the Department may refuse to recognise the instruction given by him during the current session.

Conduct and time of examination.

4. The examination will be conducted by the Local Committee where no special superintendent is nominated by the Department, and where the Department selects certain members of the Local Committee for the duty, they must conduct the examinations. In order that the examinations may be held simultaneously in Great Britain and Ireland they will commence in Ireland half-an-hour, by Dublin time, earlier than the times stated on the Time Table.

Return necessary to secure payments.

5. Immediately after the Science examinations the Secretary of each Local Committee is required to make a return of the students of his Science School who have been examined. For schools under the Commissioners of National Education this return must be made on Form No. 945 and sent to the National Board Inspector for the district by the 10th June. For schools not under the Commissioners of National Education this return must be made on Form No. 945A and sent to the Secretary, Department of Science and Art, London, S.W., by the 10th June. No claim for payment on account of the success of any person whose name is not included in the list on Form No. 945 or 945A can be considered.

Restrictions in payments.

6. No payments are made on account of success in the elementary stage of Science Subject No. XX. (Navigation) or in the elementary stage of Science Subject No. XXI. (Nautical Astronomy) obtained by a pupil in any of the Navigation Schools belonging to the Commissioners, nor can the teachers

of such schools claim such payments on account of any other pupils in these subjects.

Payments are made on account of students who pass in the higher stages of these subjects.

7. Teachers holding the Commissioners' certificates of the 1st or 2nd class are not paid upon as students of Science Schools when they pass in the 1st stage of Science Subject V. (Mathematics).

8. Teachers holding the Commissioners' certificates of the 1st class are not paid upon as students of Science Schools when they pass in the 1st or 2nd stage of Science Subject V. (Mathematics), or in the elementary stage of either division of Science Subject VI. (Theoretical Mechanics), of Science Subject VIII. (Sound, Light, and Heat), or of Science Subject IX. (Magnetism and Electricity).

9. Teachers who hold the Commissioners' special certificates for Navigation are not paid upon when they pass in the elementary stage of Science Subject XX. (Navigation) or of Science Subject XXI. (Nautical Astronomy).

10. Teachers who hold the Commissioners' 3rd class certificate are not paid upon as students of Science Schools when they pass in the elementary stage of Science Subject XXIV. (Principles of Agriculture), and teachers holding 1st or 2nd class certificates are not paid upon when they pass in the elementary or advanced stages of the same subject.

11. Payments are made on account of teachers who pass in the higher stages of the subjects specified in the foregoing sections 7, 8, 9, and 10, and the restrictions in those paragraphs do not apply to female teachers.

12. No pupil or monitor in a school under the Commissioners of National Education who has not, *on or before 1st November* preceding the examination passed the Standard of the 2nd stage of the 5th class or been placed in the 6th class may be presented for examination by the Department of Science and Art, or registered, in any subject of Science; and no pupil or monitor who has not, *on or before 1st November* preceding the examination, passed the Second examination of the 6th class may be presented for examination, or registered, in Subject XXIV., Principles of Agriculture.

No pupil in a school under the Commissioners of National Education who has been examined by an officer of the Commissioners since the previous 1st August in any subject, for an extra branch fee, may be presented for examination in that subject by the Department of Science and Art.

Any student who has made even one attendance at a National School since the 1st August preceding the examination of the Department of Science and Art is considered to be a pupil of that School for that year.

Returns to be made by Schools.

13. On receipt of Form No. 1104, or of Form No. 1160, the Department will send to the Secretary of the Local Com-

mittee Form No. 88 for its formal constitution (or if a Committee exists, but has not received permanent recognition, Form No. 168 for its formal renewal) (*see* Science and Art Directory, § IX.), together with Form No. 120 for particulars of the time-table, &c. (*see* Science and Art Directory, § XVI.).

On receipt of the Form No. 120 the Department will, in order to avoid delay, send the requisite registers, but this must not be understood to imply the definite recognition of the Science School.

The following rules apply only to Science Schools established in schools under the patronage of the Commissioners of National Education in Ireland, or taught by their teachers, and to the pupils of those schools:—

Approval of arrangements.

14. If the Science Class is held in a school under the patronage of the Commissioners of National Education, or is taught by their teachers, the Department will place itself in communication with the Commissioners of National Education, and the Science Class will not be finally approved until the Commissioners have given their sanction, which will be communicated to the Secretary of the Local Committee.

Special qualification of teachers.

15. Teachers who hold the Commissioners' certificates of the 1st and 2nd class are considered qualified to earn payments on results from the Department of Science and Art in the 1st stage of Science Subject V. (Mathematics), and those who hold certificates of the 1st class to earn payments in the 1st and 2nd stages of that Subject.

16. Teachers who hold the special Navigation certificate of the National Board are considered qualified to earn payments on results in the elementary stage of Science Subject XX. (Navigation) and in the elementary stage of Science Subject XXI. (Nautical Astronomy).

17. Teachers who, previous to 1885, held a 3rd class certificate of the National Board in Agriculture, and who had at that date earned from the Department of Science and Art payments on results in the elementary stage of Science Subject XXIV. (Principles of Agriculture), will still be recognised as qualified to earn payments on results in the elementary stage of that Subject.

18. Teachers who, previous to 1885, held the Commissioners' certificates of the 1st or 2nd class and who had at that date earned payments from the Department of Science and Art in the elementary and advanced stages of Science Subject XXIV. (Principles of Agriculture) will still be exceptionally recognised as qualified to earn payments on results in the elementary and advanced stages of that Subject.

19. Only those teachers whose Committees have applied for their recognition in accordance with sec. 5*a*, page 25 of the

Science and Art Directory, can claim the advantage of the provisions of the above paragraphs Nos. 15, 16, 17, and 18.

Inspection.

20. In addition to the visits of officers of the Department of Science and Art the Inspectors of the National Board occasionally visit the Science Schools and note whether the rules of the Department are properly carried out. They also examine the attendance registers of the Science Schools and report to the Board, which will, when necessary, communicate with the Department of Science and Art.

Examinations.

21. The examinations of the Department of Science and Art are superintended and inspected by its officers and by the officers of the Commissioners. The Commissioners will decide the schools in which the examinations are to be conducted by their officers, who will take charge of the conduct of the examinations in as many as possible of their schools. Where no special superintendent is nominated the examinations will be conducted by the Local Committee, and where the Department selects certain members of the Local Committee for the duty, by such members. When an examination is conducted by an officer of the Commissioners one member only of the Committee of each class under examination need be present, but this only applies to cases in which the officer of the Commissioners is present during the whole time of the examination, and not to cases of simple inspection. When a National Board officer is not available, the Secretary of the Committee is expected to attend each night with the other members of the Committee whose presence is required by the Department's regulations.

22. The officer of the Commissioners of National Education who conducts the examination is held responsible for seeing that the regulations of the Department are strictly complied with. If any irregularity should take place he will report the facts to the Department, when the Department's grant may be reduced, or the examination may be cancelled and all payments withheld.

Limitation of examination.

23. In a class held in a National School the number of pupils who may be presented for examination will be limited to the capacity of the school, and no such class can be examined at more than one centre.

CHAPTER III.

REGULATIONS SPECIAL TO ART.

PART I.

SCHOOLS OF ART AND ART CLASSES.

Art instruction and examinations.

1. Aid is given towards instruction in the following subjects of Art *:

Subject 1. LINEAR DRAWING BY AID OF INSTRUMENTS.
1*a*. Linear Geometry (including problems in Practical Plane and Solid Geometry and Graphic Statics).
1*b*. Machine and Building Construction and Naval Architecture—Drawings from copies.
1*c*. Linear Perspective.
1*d*. Architecture—Drawings from copies.
1*e*. Sciography.

Subject 2. FREEHAND OUTLINE DRAWING OF RIGID FORMS FROM FLAT EXAMPLES.
a. Objects.
b. Ornament (showing elementary principles of design).

Subject 3. FREEHAND OUTLINE DRAWING FROM THE "ROUND."
a. Models and objects. *b*. Ornament.

Subject 4. SHADING FROM FLAT EXAMPLES.
a. Models and objects. *b*. Ornament.

Subject 5. SHADING FROM THE "ROUND" OR SOLID FORMS.
a. Models and objects. *b*. Ornament.
c. Drapery. *d*. Time sketching and sketching from memory.

Subject 6. DRAWING THE HUMAN FIGURE, AND ANIMAL FORMS, FROM FLAT EXAMPLES.
a. In outline. *b*. Shaded.

Subject 7. DRAWING FLOWERS, FOLIAGE, AND OBJECTS OF NATURAL HISTORY, FROM FLAT EXAMPLES.
a. In outline. *b*. Shaded.

Subject 8. DRAWING THE HUMAN FIGURE, OR ANIMAL FORMS, FROM THE "ROUND" OR NATURE.
a. In outline from casts.
b. Shaded (details). b_2. Shaded (whole figures).
c_1. Studies of heads, *hands, and feet* from the life.
c_2. Studies of the human figure from nude model.
d. Studies of drapery arranged on figure from antique or on the living model.
e. Time sketching.
f. Sketching from memory.

Subject 9. ANATOMICAL STUDIES OF THE HUMAN FIGURE OR OF ANIMAL FORMS.
a. *Students' own setting of bones and muscles drawn or painted within the outline of a figure.*
b^1. *Drawn or painted from the skeleton or anatomical figure.*
b^2. *Drawn or painted from copies.*
c. *Students' own setting of bones and muscles, modelled.*
d^1. *Modelled from the skeleton or anatomical figure.*
d^2. *Modelled from the flat.*

* A Supplement to the Directory containing illustrations of "the Principal Stages of Art Instruction" is published—*price* 2*s*. 6*d*. [*See* List of Publications at end of Directory.]

Subject 10. Drawing flowers, foliage, landscape details, and objects of natural history, from nature.
a. In outline. *b*. Shaded.

Subject 11. Painting ornament from flat examples.
a. In monochrome } either in water-colour, tempera, or oil.
b. In colours }

Subject 12. Painting ornament from the cast, &c.
a. In monochrome, either in water-colour, oil, or tempera.

Subject 13. Painting from flat examples—flowers, still-life, &c.
a. Flowers or natural objects, in water-colour, in oil, or in tempera.
b. Landscapes, or views of buildings.

Subject 14. Painting direct from nature.
a. Flowers, or still-life, in water-colour, oil, or tempera without backgrounds.
b. Landscapes, or views of buildings. *c*. Drapery.

Subject 15. Painting (from nature) groups of still-life, flowers, &c., as compositions of colour.
a. In oil colour. *b*. In water-colour or tempera.
c. In monochrome, or light and shade.

Subject 16. Painting the human figure or animals in monochrome from casts.
a. In oil, water-colour, or tempera.

Subject 17. Painting the human figure or animals in colour.
a. From the flat, or copies.
b. The Head or draped figure from nature.
c. The nude figure from nature. *d*. Time sketches.

Subject 18. Modelling ornament.
a. From details, such as single ornamental devices, scrolls, &c.
b. From casts of ornamental compositions for pilasters, friezes, &c.
c. From drawings or photographs.
d. Time sketches from examples.
e. Modelling from memory.

Subject 19. Modelling the human figure or animals.
a. *Hands and feet from casts.*
b[1]. *Heads and masks from casts, in the round, or from casts in relief.*
i. *Heads and masks in relief from casts in the round.*
b[2]. *Whole figures from casts of figure in the round, or from casts of figure in relief.*
k. *Whole figures in relief from casts of the figure in the round.*
c. *Modelling the figure or animal forms from the flat.*
d. *Heads, hands, and feet from nature, in the round.*
l. " " " *in relief.*
e. *The human figure from the nude model in the round.*
h. " " " *in relief.*
f. *Modelling drapery from actual stuffs and not from casts.*
g. *Modelling from memory.*

Subject 20. Modelling fruits, flowers, foliage, and objects of natural history, from nature.

Subject 21. Time sketches in clay of the human figures, or animals, from nature.

Subject 22. Elementary Design.
a. Studies treating natural objects ornamentally.
b. Ornamental arrangements to fill given spaces in outline, monochrome or modelled.
c. Ornamental arrangements to fill given spaces in colour.
d. Studies of historic styles of ornament drawn or modelled.

Subject 23. Drawings from actual measurements of structures, machines, &c., applied designs, technical or miscellaneous studies.
g. Architecture and building construction—drawings from actual measurements, taken by the student, of existing structures.

b. Architecture and building construction—original designs.
c. Ornamental design as applied to decorative or industrial art.
d. Figure composition, and ornamental design with figures, as applied to decorative or industrial art.
e. and *f*. The same as 23*c* and 23*d*, but in relief.
g. Machine construction and naval architecture—drawings from actual measurements, taken by the student, of existing machines, ships, &c.
h. Machine construction and naval architecture—original designs.

2. The examinations in Art are—
(*a*) for Elementary Schools, see pp. 91 to 99 ;
(*b*) for Training Colleges, see p. 102;
(*c*) for Schools of Art and Art Classes, see pp. 72 to 76.

PREMISES, FITTINGS, APPARATUS, AND EXAMPLES.

Premises.

3. A School of Art must be under public management and held in rooms approved by the Department, which are wholly devoted to elementary and advanced instruction in Art. The school must be adequately supplied with apparatus and examples, and be always open for study and the inspection of the Art examples. School of Art.

Detailed information in respect of Schools of Art must be sent to the Department in Form No. 527 upon the formation of Schools of Art, and as the Department may require.

4. An Art Class may be held in a Mechanics' Institute, School, or other Public Institution; but it must be adequately supplied with apparatus and examples for instruction. Art Class.

Building Grants (*see* § XIII.).

5. Particulars as to the mode of application for a grant to build or adapt a building as a School of Art are given at p. 116. Building grants.

N.B.—Grants for fittings, apparatus, and examples are suspended, except in Ireland, while the Local Taxation (Customs and Excise) Act, 1890, remains in force. The conditions under which such grants are made in Ireland are contained in Form No. 48 which can be obtained on application. Fittings and apparatus grants.

TIMES OF MEETING FOR INSTRUCTION AND TEACHING STAFF.

Meetings of Classes in Schools of Art.

6. In Schools of Art both Day and Night Classes must be held, and there must be a Night Class for Artizans meeting under the instruction of the master for two hours at least three times a week during forty weeks in the year. Times of meeting.

Branch Classes.

Branch classes of Schools of Art.

7. A branch Class of a School of Art may be formed, provided that it is taught by the master of the School of Art, or under his direction by a teacher holding the Art Class Teacher's Certificate, or an Art Master's Certificate, Group I.; that it has a Night Class for Artizans; and is in the same district and under the management of the same Committee as the School of Art.

Qualification of Art Teachers.

Schools of Art.

8. A School of Art must be under the instruction of a teacher holding an Art Master's Certificate, Group I. (*see* p. 68).

(*a.*) In cases of the master's illness, the Department may provide a substitute on condition that the Committee pay him 20*s.* a week during the time his services are required. No substitute so provided can remain longer than three months.

(*b.*) Ex-National Scholars may be recognised as Teachers of Modelling, or of any special branch of Art which they are qualified to teach, in Schools of Art or Art Classes; but they cannot be recognised as Head Masters of such Schools or Classes unless they hold, respectively, the Art Master's Certificate, Group I., or the Art Class Teacher's Certificate.

Art class.

9. An Art Class must be under the instruction of a teacher holding the Art Class Teacher's Certificate or an Art Master's Certificate (*see* pp. 67, 68).

(*a.*) Classes under the instruction of teachers holding either the Elementary School Teacher's Certificate D., the 2nd grade Drawing Certificate, or the new Elementary Drawing Certificate, (First Class), may be registered for payments on the results of the May examinations in the Elementary Stages of Subjects 2*b*, 3*a*, and 5*b*, and Science Subject I. *and Geometrical Drawing* (*Art*): as well as for payments on results of the May Art examinations in the Elementary Stages of any other Art Subjects in which the Teachers have obtained a First Class in the Elementary Stage.

(*b.*) Classes under the instruction of Teachers holding either the Elementary School Teacher's Certificate D., or the 2nd grade Drawing Certificate, or of Teachers qualified to earn payments on results in Science Subject I. may be registered for payments on the results of the May examination in the Elementary Stage (only) of Perspective—Subject 1*c*.

Certificates.

Certificates.

10. There are three forms of Certificate for Art Teachers—

(i.) The Elementary Drawing Certificate (First Class and Second Class);

(ii.) The Art Class Teacher's Certificate; and

(iii.) The Art Master's Certificate.

These several Certificates can be claimed when the examinations detailed in the succeeding paragraphs have been passed. In applying for his Certificate the Applicant must state when and where he passed the examinations.

Re-examination.

Applicants for Certificates may be required to be re-examined in any subject in which they have passed more than three years previously.

A teacher holding the Art Master's Certificate, Group IV. only, is not qualified for the Head Mastership of a School of Art. (*See* par. 8.)

Specially qualified persons may be exceptionally recognised.*

* *See p. 90 for certificate of special qualification to earn grants for Drawing in Elementary Schools.*

11. The requirements for the ELEMENTARY DRAWING CERTIFICATE (First Class) are a First Class in the Elementary Stage of:— Elementary Drawing Certificate.

(*a.*) Freehand Drawing (Subject 2*b*);
(*b.*) Model Drawing (Subject 3*a*);
(*c.*) *Drawing in Light and Shade from a Cast* (*Subject 5b*); and
(*d.*) A Pass in the Elementary Stage of Science Subject I.

Candidates who before the 1st January 1893 have obtained—

(i.) A pass in Geometrical Drawing, Section 1, Science Subject I., or a pass in 2nd Grade Geometry and also a first Class in 2nd Grade Examination in Linear Perspective; or

(ii.) A pass in Geometrical Drawing, Section 1, Science Subject I., or a pass in the 2nd Grade Examination in Geometry, and now take a 2nd Class in the Elementary Stage of the new Examination in Perspective; or

(iii.) A 1st Class in the 2nd Grade Examination in Perspective, and now take a pass in *Geometrical Drawing* (*Art*).

will not be required to pass in the Elementary Stage of Science Subject I. to obtain the new Elementary Drawing Certificate.

(iv.) A pass in Model Drawing with chalk on the blackboard taken before 1st January 1893, will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Model Drawing (Subject 3*a*).

(v.) A pass taken before 1st January 1893 in Drawing in Light and Shade will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Shading from Casts (Subject 5*b*).

(vi.) A 1st Class taken before 1st January 1893 in the 2nd Grade Examination in Freehand will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Freehand Drawing of Ornament (Subject 2*b*).

(vii.) A 1st Class taken before 1st January 1893 in the 2nd Grade Examination in Model Drawing will count for the new Elementary Drawing Certificate instead of a 1st Class in the Elementary Stage of Model Drawing (Subject 3*a*).

12. The requirements for the ELEMENTARY DRAWING CERTIFICATE (Second Class) are—

(*a.*) a pass in the Elementary Stage of Science Subject I.;
(*b.*) a 2nd Class in the 2nd Grade Examination in, or the Elementary Stage of, Model Drawing (Subject 3*a*); and
(*c.*) a 2nd Class in the 2nd Grade Examination in, or the Elementary Stage of, Freehand Drawing (Subject 2*b*).

13. For the ART CLASS TEACHER'S CERTIFICATE; Art Class Teacher's Certificate.

The satisfactory execution of the following works:—*

(*a.*) Subject 1*a*. Six or eight geometrical problems worked in ink with instruments; the problems being stated in writing. (On an imperial sheet.)

(*b.*) Subject 3*b*. An outline in pencil of ornament in low relief from the cast from the Madeleine or Louis XII. pilasters, or any large ornamental scroll. (On an imperial sheet.) Drawings from casts in relief of the same size as the originals may not be submitted for examination.

(*c.*) Subject 5*a*. A drawing from a group of models which should include vases such as those produced by Wedgwood or Minton, or similar objects placed upon a drawing board, drawn without background, and shaded in chalk or pencil.† (On an imperial sheet.) Enough of the board must be drawn to show that the Perspective is accurate. The horizon must be kept within the sheet of paper on which the models are drawn.

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* *See Supplement to Directory for illustrations of the character of these works.*

† *Instead of work in chalk or pencil, drawing in sepia may be submitted and will accepted for the Certificate, the marks being awarded for correct drawing only and not for merit in water colour washing.*

(*d.*) Subject 5*b*. A shaded drawing in chalk or pencil from a piece of ornament in high relief, or from casts of fruit. (On an imperial sheet.) Drawings from casts in relief of the same size as the originals may not be submitted for examination.

and a First Class in the :—

(*e.*) Elementary Stage of Perspective (Subject 1*c*).
(*f.*) Advanced Stage of Drawing in Outline from the Cast (Subject 3*b*).
(*g.*) ,, ,, Shading from Models (Subject 5*a*).
(*h.*) ,, ,, Drawing in Light and Shade from a Cast (Subject 5*b*), and
(*i.*) A Pass in the Elementary Stage of Science Subject I.*

14. For the ART MASTER'S CERTIFICATES :

Art Master's Certificates.

These Certificates are only issued to Candidates who have obtained the Art Class Teacher's Certificate. The requirements for the Certificate, Group 1.—(Elementary Drawing, Colouring, and Design) are—

The satisfactory execution of the following works :—†

(*a.*) Subject 1*c*. *One* Perspective problem stated in words and *clearly* worked in ink *to fill* an imperial sheet.
(*b.*) Subject 1*d*. A sheet of the classic orders of architecture carefully inked in, and not less than three mouldings shaded in Indian ink or sepia. The orders must be named and the authority for each drawing given with a reference to the building from which it is derived. (On an imperial sheet.)
(*c.*) Subject 2*b*. A sheet of diagrams derived from Dyce's Drawing Book, Albertolli's Ornament, Jacobsthal's Grammatik der Ornamente, and instruction in the School, showing the application of the principles on which Foliated Design is constructed. Under each diagram must be stated the principle it illustrates. Copies of examples merely blocked in are not sufficient. (On an imperial sheet.)
(*d.*) Subject 8*a*. An outline of the Figure from the cast. (On an imperial sheet.) The drawing should be a careful and accurate rendering of the contour of the figure and of such of the forms within the contour as can be rendered, or in some measure expressed, by a line. *Shaded drawings without back-grounds, if sufficiently accurate in form, will be accepted from candidates who prefer to work in that manner.*
(*e.*) Subject 10*a*. A sheet of Foliage drawn in outline from a freely growing plant. (On an imperial sheet.)
(*f.*) Subjects 14 and 22. A study, in colour, of a growing plant from nature, not pictorially represented (*i.e.*, with accidents of light and shade), but simply and directly drawn, with details (separately if required) selected by the student as being characteristic of its growth and suggestive of ornament, together with three designs based upon the plant. These designs must occupy, in a decorative way, a square, a circle, and an oblong. One of them must be in monochrome, one in two colours, and one in polychrome. In each case the plant must be, not merely composed into the given space, but treated in accordance with decorative conditions. (On an imperial sheet.)
(*g.*) Subject 22*b*. A design in outline embodying the principles learnt in Subject 2*b*. (On an imperial sheet.) It is necessary that the ground be tinted with a wash of colour. The outline, which should be part of the design, must be executed with a broad pen or a brush.

and a First Class in—

(*h.*) Architecture ; and
(*i.*) Principles of Ornament (Elementary Stage).

Female Candidates are not required to submit a work in Subject 1*d* nor to sit or the Examination in Architecture.

15. Certificates for the other Groups (II. to VI.) of subjects of Art instruction are also granted on passing the Examinations, the details of which are given at page 287.

* *Privileges (i) to (iii) in par. 11, p. 67, are applicable to Candidates who have obtained successes towards the Art Class Teacher's Certificate.*

† *See Art Supplement to Directory (price 2s. 6d.) for illustrations of the character of these works.*

16. Irrespective of the above-mentioned Certificates, (Group II. to VI.), Candidates receive recognition on their Art Class Teacher's, or Art Master's, Certificate, if they send up a satisfactory work, and obtain a first class at the May examinations in the following sub-groups, while a student who has not taken a certificate receives a card showing his success in any of these subjects:—

(*a.*) Subject 8*b*[2]. A shaded drawing of a complete figure from the Antique. (On an imperial sheet.) — Drawing from Antique.

(*b.*) Drawing from an Antique figure, and Drawing the Antique from memory.

(*a.*) Subjects 11, 12, or 23. A Decorative Painting in Monochrome of an Ornament in grisaille on a coloured ground in oil or tempera. (On a sheet or canvas 30 ins. × 7 ins.) — Painting in monochrome.

(*b.*) Painting ornament in monochrome, in oil or tempera from a sketch or photograph.

(*a.*) Subject 15*a*. A Study of a Group of Still Life or flowers, as a composition of colour, in oil. (On a canvas of half imperial size.) — Still life painting.

(*b.*) Painting from Still Life.

(*a.*) Subject 15*b*. A group of Flowers painted from nature in water-colour. (On an imperial sheet.) — Flower Painting

(*a.*) Subject 22*d*. A set of fifteen studies of Ornamental Design, showing the treatment of diapers, friezes, borders, panels, pilasters, &c., in colour or relief from original examples, either in the South Kensington Museum or elsewhere, THE AUTHORITY BEING GIVEN ON EACH SKETCH illustrative of the modifications evolved during various historic periods. — Ornament.

These studies should be coloured and shaded sufficiently to exhibit the treatment and modifications, and should not be highly finished specimens of still life painting.

Sections should be given of those parts of relief ornament which can be easily shown in that way, such as mouldings, and in the representation of embroidery, the direction of the stitching should be given.

Students in country schools may make their studies from works on Architecture or Ornamental Art, and should supplement them as far as possible from examples in local Museums and in churches or houses in the neighbourhood.

(*b.*) Principles of Ornament (Advanced Stage).

(*a.*) Subject 23*c*. A drawing of a flowering plant (such as that drawn in (*f*) for Group I.—see p. 68), together with three designs for patterns from it modified to suit the technical requirements of three different processes; for instance, embroidery, inlay, paper hanging, printed muslin, woven silk, painted tiles. The material must be named for each design. (These four drawings to be on an imperial sheet.) — Design Ornament (Advanced Stage).

(*b.*) Design. Ornament (Advanced Stage).

(*a.*) Subject 8*c*[2]. A shaded drawing of a complete figure from the Life. (On an imperial sheet.) — Drawing from the Life.

(*b.*) Drawing from the Life.

(*a.*) Subject 9*a*. (Two drawings.) (*a*) The Bones and (*b*) the Muscles placed within the outline of an Antique figure, or of a study from the life, or of one of the photographs from the nude figure by Michelangelo in the Sistine Chapel. (On imperial sheets.) — Anatomy.

(*b.*) Anatomy.

(*a.*) Subject 22*d*. Varied studies of Historic styles of Ornament, sufficiently extensive to represent the history of the styles selected, sketched from works in the South Kensington Museum, THE AUTHORITY IN EACH CASE BEING GIVEN. If they are from coloured ornament, the sketches are to be coloured also. (On two imperial sheets.) — Historic Ornament.

These studies should be coloured and shaded sufficiently to exhibit the treatment and modifications, and should not be highly finished specimens of still life painting.

Sections should be given of those parts of relief ornament which can be easily shown in that way, such as mouldings, and in the representation of embroidery, the direction of the stitching should be given.

Students in country schools may make their studies from works on Architecture or Ornamental Art, and should supplement them as far as possible from examples in local Museums and in churches or houses in the neighbourhood.

(*b.*) Historic Ornament.

Design Ornament (Honours).

(*a.*) Subject 23*d*. A design of ornament and figures as applied to decorative or industrial Art. This design should be not less than 15 inches in its longest direction, and should be neatly executed in light and shade. It is essential that figures should form an important feature of the design. (On an imperial sheet.)

(*b.*) Design—Ornament (Honours).

Modelling Ornament.

Subject 18*b*. A study of Ornament modelled from the cast. (On a panel 18 ins. by 24 ins.)

Modelling from the Antique.

(*a.*) Subject 19*b*[2]. A model of an Antique figure, not less than 30 ins. high, either in relief or in the round.

(*b.*) Modelling from the Antique.

Modelling Design Ornament (without the Figure).

(*a.*) Subject 23*e*. A modelled design based on a flowering plant, together with three designs for patterns from it modified to suit the technical requirements of three different processes; as, for instance, carving, casting, wrought metal. The material must be named for each design. (Arranged on a panel 18 ins. by 24 ins.)

(*b.*) Modelling, Design—Ornament (Advanced Stage).

Modelling the Figure.

(*a.*) Subject 19*e*. A model not less than 30 ins. high of the complete figure from the Life.

(*b.*) Modelling in relief from the Life.

Historic relief ornament.

(*a.*) Subject 22*d*. Various drawings of the relief ornament of Historic styles drawn from the casts, carvings, metal work, &c. in the South Kensington Museum, WITH WRITTEN AUTHORITIES FOR EACH; and sufficiently extensive to represent the history of the various styles selected. (On two imperial sheets.)

These studies should be coloured and shaded sufficiently to exhibit the treatment and modifications, and should not be highly finished specimens of still life painting.

Sections should be given of those parts of relief ornament which can be easily shown in that way, such as mouldings, and in the representation of embroidery, the direction of the stitching should be given.

Students in country schools may make their studies from works on Architecture or Ornamental Art, and should supplement them as far as possible from examples in local Museums and in churches or houses in the neighbourhood.

(*b.*) Historic Ornament.

Modelling Design (including the Figure).

(*a.*) Subject 23*f*. A modelled Design in relief of Ornament and Figures as applied to decorative Art.

(*b.*) Modelling, Design—Ornament (Honours).

Perspective.

(*a.*) Subject 1*e*. A sheet of exercises in Sciography. (On an imperial sheet.)

(*b.*) Perspective (Advanced Stage).

Architectural drawing.

(*a.*) Subject 23*a* (1). A Measured drawing from a Building or portion of a building, with the Shadows accurately projected, and tinted. (On an imperial sheet.)

(*b.*) Science Subject III. (Building Construction), Elementary stage.

Architectural design.

(*a.*) Subject 23*a* (2.) A Measured drawing in outline of an interior decorative detail, such as a tomb, a doorway, a choir stall, or the like, in stone, wood, or metal. (On an imperial sheet.)

(*b.*) Architectural Design.

REGULATIONS AS TO STUDENTS.

Registration.

Registration of lessons and attendances.

17. A Student may not be registered for lessons in more than two of the following groups of subjects bracketed together on any one day; nor for more than one lesson in any one Group—except on a Saturday, when lessons in three groups of subjects may be registered. He may not be registered for a grant both under the rules for grants for Drawing in Evening Continuation Schools and under the rules for payments on results to Schools of Art or Art Classes. (*See* Form No. 1069, p. 113.)

No Scholar receiving instruction at an Elementary School in the obligatory or standard subjects of the Education Code can be registered as a student of a School of Art or Art Class.

In order that payment may be claimed in any subject on account of a student he must have attended at least 20 lessons in the group which includes that subject; *and each lesson in that group must be of at least one hour's duration.* To assist Local Committees in making their claims for payment, a reference is given against each group to the paragraphs regulating the payments under that group.

A. Drawing.	Freehand Drawing of Ornament (2*b* and 3*b*). Model drawing (3*a* and 5*a*). Drawing in Light and Shade from Casts (5*b*).	Payments under §§ 31*a*, *c*, and *e*.
B. Architecture.	Architecture (1*d*). Architectural design (23*b*). *Perspective (1*c* and 1*e*). Mechanical drawing (Subjects 1*b* and 23*a*).	Payments under §§ 31*a*, *c*, and *e*.
C. Theory and Designing.	Principles of ornament (22). Historic ornament (22*d*). Design—Ornament (Elementary and Advanced Stages) (23*c*).	Payments under §§ 31*a*, *c*, and *e*.
D. Painting.	Painting ornament in monochrome (11*a*). Painting from still life (15).	Payments under §§ 31*c* and *e*.
E. Study of the Figure.	Anatomy (9). Drawing and painting from the life (8*c* and 17). Drawing and painting from the antique (8 and 16). Design (Honours) (23*d*).	Payments under §§ 31*c*, *d*., and *e*.
F. Modelling.	Modelling from a Cast (18*a*). Modelling Design—Ornament (23*e* and 23*f*). Modelling from the Life (19*h*). Modelling from the Antique (19*b*[1]).	Payments under §§ 31*a*, *c*, *d*, and *e*.

A separate register of attendances must be kept in respect of Geometrical Drawing (Art), for which payments on results of examinations are made under par. 31*b*.

*Note.—Attendances in Science Subject I. qualify for payments on results of examinations in Perspective.

EXAMINATIONS.

Local personal examinations.

18. Time Table of Art Examinations in England, Scotland, and Wales.

1896.

25*th April, Saturday.*	7 to 10 p.m.	*Geometrical Drawing (Art).*
27th „ Monday.	7 to 10 p.m.	Drawing in Light and Shade, Subject 5*b* (Elementary Stage).
	7 to 10 p.m.	Anatomy, Subject 9.
28th „ Tuesday.	7 to 8 p.m.	Model Drawing, Subject 3*a* (Elementary Stage).
	8.30 to 10 p.m.	Freehand Drawing of Ornament, Subject 2*b* (Elementary Stage).
29th „ Wednesday.	7 to 9.30 p.m.	Freehand Drawing of Ornament, Subject 3*b* (Advanced Stage).
30th „ Thursday.	6 to 10 p.m.	Drawing in Light and Shade, Subject 5*b* (Advanced Stage).
1st May, Friday	6 to 10 p.m.	Perspective, Subjects 1*c* and 1*e* (Elementary and Advanced Stages).
2nd „ Saturday.	6 to 10 p.m.	Drawing from the Life, Subject $8c^2$.
4th „ Monday	6 to 10 p.m.	Design, Subjects 23*c* and 23*d* (Elementary and Advanced Stages, and Honours).
5th „ Tuesday	10 a.m. to 4 p.m.	Painting from Still Life, Subject 15.
	7 to 9.30 p.m.	Model Drawing, Subject 5*a* (Advanced Stage).
6th „ Wednesday.	6 to 10 p.m.	†Drawing from the Antique, Subject $8b^2$.
7th „ Thursday.	6 to 10 p.m.	Painting Ornament in Monochrome, Subject 11*a*.
8th „ Friday	7 to 10 p.m.	Principles of Ornament, Subject 22 (Elementary and Advanced Stages).
9th „ Saturday.	6 to 10 p.m.	Architecture, Subject 1*d*.
	7 to 10 p.m.	Historic Ornament, Subject 22*d*.
11th „ Monday	7 to 8 p.m.	Drawing the Antique from Memory, Subject 8*f*.
11th „ Monday to 13th „ Wednesday.	4 to 10 p.m.	Architectural Design, Subject 23*b*.

This Time-table is modified in Irish schools.

Note.—On the 5th, 11th, 12th, and 13th May, the six hours include half an hour for refreshment. On the 5th May the half hour must be taken by all Candidates from 1 p.m. to 1.30 p.m. On the other dates the half hour each evening must be taken by all Candidates from 7 p.m. to 7.30 p.m.

† The Examination in Drawing from the Antique is allowed only at centres of examination which have at least four full-size figures.

Where there is no Special Local Secretary (§ XXII.) a Member of *the Local Committee, or a Superintendent previously nominated by the Local Committee and approved by the Department,* may be paid a fee of half a guinea for *his* supervision of an Art Examination held in the DAY time or afternoon before 7 p.m. Of this fee one moiety must be contributed by the locality. When a certificate is received from the Chairman and Secretary of the Committee that a moiety has been lodged with them the Secretary will receive the other moiety from the Department. He must then pay to the Superintendent the full fee of half a guinea for the day's examination.

19. The regulations for the conduct of Examinations in Art at Schools of Art and Art Classes in 1896 will be similar to those given in Form No. 965*c*, 1895 (*see* p. 138).

20. The Department may require from a Local Committee a payment of 2*s.* 6*d.* for every paper worked by a candidate (and 5*s.* for every modelled work) which the examiner reports as obtaining less than 25 per cent. of the marks. A Local Committee may, therefore, call upon any candidate who against their wish insists upon entering for examination in any subject to deposit 2*s.* 6*d.* (and 5*s.* for each Modelling Subject), to be returned if the Department does not require such payment from the Committee. External candidates may be required by the Local Committee or Special Local Secretary to make a similar deposit of 2*s.* 6*d.* for each subject of examination (and 5*s.* for each Modelling Subject), in addition to the usual examination fee. Fees chargeable to intending candidates.

Examinations in Modelling.

21. Examinations in Modelling, Subject 18*a* (Elementary Stage), are held during the months of February to June only, by an officer of the Department. These examinations are held only in Schools of Art and in Art Classes which are under the instruction of a teacher holding the Art Master's Certificate, Group I., where a class for modelling has received at least 28 lessons in the 12 months preceding the date of examination, and there are 10 or more students in average attendance. The time allowed for the Examination is 2½ hours. No candidate may be presented for Examination who has not received 20 lessons at least. Examinations in modelling. Subject 18*a*.

22. The attendances made during the 12 consecutive months from the date of the previous Examination may be used in support of the claims for payments on the results of these Modelling Examinations (Elementary Stage).

23. For these Modelling examinations (Elementary Stage) in Subject 18*a* application must be made on Form No. 1175*b*, which must be sent in to the Department on or before 16th January, after which date no further applications will be admitted.

24. Local Committees of Schools of Art and Art Classes qualified as above, at which, however, less than 10 students are in average attendance at the instruction in Modelling, Subject 18*a*, may arrange amongst themselves to apply on a Form No. 1170 on or before 16th January for the combined examination of their students at one convenient centre. Combined examinations.

25. Students who sit for examination in Modelling, Subject 18*a* (Elementary Stage), cannot in the same year send modelled works to London for examination.

26. Examinations in Modelling in Subjects 19*h*, 19*b*[1], 23*e* and 23*f* are held also at local centres where the Candidates sitting for examination in Modelling are themselves prepared to cast their own models, and where proper arrangements are made for them to do so. Examinations in Modelling Subjects 19*h*, 19*b*[1], 23*e* and 23*f*.

27. Application for these examinations must be made in Form No. 119. (See also par. 20 above, as to fees chargeable to intending candidates.) The dates of these examinations are as follow :—

1896.			
14th May,	Thursday and	6.30 to 10 p.m. each evening.	Modelling. Design, Subject 23*e*. (Elementary and Advanced Stages).
15th „	Friday		
16th „	Saturday.	Eight hours between 10 a.m. and 10 p.m. (See *Note* below.)	For Candidates to Cast their Clay Models. Subject 23*e*.
18th „	Monday to	6.30 to 10 p.m. each evening.	Modelling from the Antique, Subject 19*b*[1].
21st „	Thursday.		
22nd „	Friday.	Eight hours between 10 a.m. and 10 p.m. (See *Note* below.)	For Candidates to Cast their Clay Models, Subject 19*b*[1].
1st June,	Monday to	6.30 to 10 p.m. each evening.	Modelling from the Life, Subject 19*h*.
5th „	Friday		
6th „	Saturday.	Eight hours between 10 a.m. and 10 p.m. (See *Note* below.)	For Candidates to Cast their Clay Models, Subject 19*h*.
8th „	Monday to	6.30 to 10 p.m. each evening.	Modelling. Design, Subject 23*f* (Honours).†
11th „	Thursday		
13th „	Saturday.	Eight hours between 10 a.m. and 10 p.m. (See *Note* below.)	For Candidates to Cast their Clay Models, Subject 23*f*.

Note.—The eight hours for Casting, may be taken in the morning and afternoon, or the afternoon and evening of each day. *The eight hours, including half an hour for refreshment, must be the same for all candidates attending at the same centre.*

Works sent to South Kensington for Examination.

Works sent for examination to South Kensington.

28. Works on which payments under § 31*e*, p. 76, and prizes under § 36, p. 78, are to be claimed and works for Certificates must be properly labelled according to the instructions in Form No. 564, and must be sent not later than the 1st April from Science and Art Schools and Classes to South Kensington for examination. The best of these works will be selected to enter into a National Competition for medals and prizes (*see* pars. 36 and 37, p. 78).

National Competition.

Designs carried out in materials.

In addition to drawings, paintings, and modelled work done by Students in their Schools, designs carried out in various materials, such as earthenware, porcelain, glass, metal, wood, paper, leather, textiles, &c., may be submitted to fully illustrate or explain the original, drawn, painted, or modelled designs, which have been made by the Students as school works and are at the same time forwarded for examination. The limits of size prescribed in respect of school works apply also to the designs or portions of them executed in the appointed materials, and must be carefully observed. The designs executed in materials must be labelled, and distinctive special entries made of them under the students' names in the schedule of school works. Such executed designs will not be considered unless accompanied by the designs for them, drawn, painted, or modelled by the students as school work.

Some of the executed designs, with the original drawings, paintings, or models, may be admitted to the Exhibition of National Competition Works.

Exhibition of National Competition works.

29. Works *gaining awards* in the National Competition will be exhibited in London and in some of the more important provincial towns where suitable space can be provided.

30. A work which has been once submitted may not be again submitted.

(*a*.) The Department pays the carriage of works sent from Science and Art Schools and Classes.

(*b*.) The works on which payments and prizes are to be claimed must have been executed during the previous year in the School or Class during its recognised hours of meeting; and must be restricted to Drawings, Paintings, and Models. They should be more than preparatory exercises for a personal examination—something involving greater care in execution or instruction, and different from, or beyond what is tested and paid for under the rules for the personal examinations held locally.

Works of not more importance than Exercises done at the May examinations will not therefore be considered.

The size of the works submitted for examination must not exceed the following dimensions:—

48 *in.* × 48 *in. for each Drawing or Painting in Sub-divisions of Subject* 23 *only.*
36 *in.* × 25 *in. for each Painting from the Nude Figure.*
30 *in.* × 25 *in.* „ „ *Antique, Still Life, Interiors, Landscapes, &c.*
30 *in.* × 22 *in. for Drawings in chalk, pencil, or similar materials.*
36 *in. in height for each modelled full length figure.*
36 *in. in height and* 24 *in. at the base for each Bust, modelled Group, &c.*
36 *in.* × 24 *in. for each modelled Panel.*
The above-mentioned limits of size must not be exceeded in respect of the objects or specimens manufactured in materials.

(i.) (Subject 2*a*.) Work in Subject 2*a* may not be sent up.

(ii.) (Subject 2*b*.) When larger and more important than examination work, well executed work in Subject 2*b* may be sent up.

(iii.) (Subjects 4*a* and 4*b*.) Works in these subjects may not be sent up.

(iv.) (Subjects 5*a* and 5*b*.) Works in these subjects may be sent up when they are more important and more finished than the work required for the personal examinations in the advanced stages of the same subjects.

(v.) (Subjects 6*a* and 6*b* from flat examples.) Works in these subjects may not be sent up.

(vi.) (Subject 7.) Work in this subject may not be sent up.

(vii.) (Subjects 8*a*, 8b^1, and 8b^2, and 14*a*.) Works in these subjects may only be sent up when more completely carried out (or finished) than they can be at the personal examination.

(viii.) (Subject 9.) It should be stated upon each Drawing whether it is copied from the Flat, from the Round, or is the Student's own setting of the Anatomy within an outline of a Figure.

(ix.) (Subjects 13*a* and 13*b*.) Works in these subjects may not be submitted unless well finished and from specially good examples.

(*c*.) Studies of buildings, of objects in public and private collections, landscape or landscape details, may be submitted even if executed away from the School, provided it be certified that they have been executed entirely under the supervision of the Master.

(*d*.) Drawings or paintings from flat examples or casts in relief, of the same size as the originals, may not be submitted for examination; nor may works in the modelling stages which are of the same size as the examples from which they are copied, except models from life, or flowers or foliage from nature.

Works glazed or in frames may not be submitted.

(*e*.) Only ONE satisfactory specimen of modelling may be submitted from each Student attending a modelling class. This work must be more complete than work done at personal examinations in modelling. The mouldings about decorative panels, friezes, and such like (Subjects 18, 20, 23*e*, 23*f*, *&c*.) must be always given when such works are submitted. No copies from the Cast except careful work from the antique, or important pieces of ornament, nor fragments should be sent up. Modelled work in Subjects 18*a*, 18*d*, 18*e*, 19*g*, should not be sent up.

No cast submitted for examination may be coloured. If necessary casts may be coated with a preparation of wax and turpentine without colour. No models in terra-cotta, clay, or kindred heavy material may be submitted.

Certificate works.

(*f.*) Works submitted for certificates by students of Schools of Art and Art Classes must be forwarded with the School or Class works of the session, and be duly entered on the Supplementary Fly-leaf to Form 528.

(*g.*) Only one certificate work in each subject, or one set of certificate works where more than one certificate work in the same subject is required, may be submitted in one year by the same student for any one certificate.

(*h.*) Every work submitted as a certificate work must be clearly marked with the title and Group of the Certificate for which it is submitted.

(*i.*) Candidates belonging to no School or Class must send their certificate works (carriage prepaid) direct to the Department of Science and Art, London, S.W., on or before the 1st of April. Each such candidate must fill up a Supplementary Fly-leaf to Form 528 in respect of the works submitted.

(*k.*) Successes in the National Competition obtained by Students within the last ten years will, on application, be counted as equivalent to the acceptance of Certificate Works in the same subjects provided the conditions laid down in the Directory as to size, etc., for Certificate Works have been fulfilled.

PAYMENTS ON RESULTS.

Payments on results.

31. The payments claimable, subject to the conditions of § XXXII. on account of each Student, are :—

(*a.*) 1*l.* and 10*s.* for a first class or second class respectively in the Elementary Stage of those subjects in which there is such a Stage.

(*b.*) 10*s.* *for a pass in Geometrical Drawing* (*Art*).

(*c.*) 3*l.*, 2*l.*, and 1*l.* for an excellent, first class, or second class respectively in the Advanced Stage of each subject in which there is such a Stage, and in each subject in which there is no Elementary or Adanced Stage.

(*d.*) 6*l.* and 3*l.* for a first or second class respectively in Honours.

(*e.*) 3*l.*, or a sum not exceeding 3*l.*, for the works (*see* par. 30 (*b*, *c*, *d*, and *e*)), executed during the previous year in a School of Art or Art Class during its recognised meetings.

Restrictions on payments and previous success.

32. No payment is made under the preceding heads (*a*), (*b*), (*c*), or (*d*) on account of a student who has been previously successful in a higher Stage of the same subject, or of a corresponding subject in former schemes of examination. If the student has been previously successful in the same Stage of the same subject, or in a corresponding subject, the payment on his account will be reduced by the payment which would be claimable on such previous success; but when such previous success has been obtained in a school or class under the same Local Committee, and has not been paid upon, the Department may allow the full claim.

When students sit at the same Annual Examination (*see* par. 18, p. 72) in both stages (Elementary and Advanced) of Freehand Drawing of Ornament in Outline, Model Drawing, and Drawing in Light and Shade from a Cast, and in the Elementary or Advanced Stage and Honours of Modelling Design, payment for one Stage only will be allowed on account of their successes; and in

all such cases credit will be given for the higher success obtained. Besides payments for successes in the Elementary Stage, payments may also be made on account of the same student in any one year, for not more than three other successes whether in Advanced Stage, Honours, or in subjects having no Stages.

33. In addition to the foregoing a School of Art can claim :—

Free students and Local Scholars, payments for.

(*a.*) 3*l.* for a Student obtaining a Free Studentship or Local Scholarship (*see* pars. *45* and *46*).

Payments for Art Pupil teachers.

(*b.*) A sum not exceeding 15*l.* for an Art Pupil-teacher in a School of Art in which, at least, 20 students of the Industrial Classes are considered by the Department to have been satisfactorily taught; and a further sum not exceeding 15*l.* for a second Art Pupil-teacher, in schools in which there are, at least, 50 or more such students.

Branch classes of Schools of Art may not claim more than one sum under this article.

Local committees should understand that the grant is to assist them in training young, deserving, and qualified students to become Teachers, and is not claimable in respect of members of the Teaching Staff.

The Local Committee must annually notify their appointment of an Art Pupil-teacher to the Department. The candidate appointed by the Committee must not be required to pay fees for instruction; must have passed the 2nd Grade examination in Freehand, Geometry, Model and Perspective Drawing, or have obtained corresponding or higher qualifications at the Art examinations of the Department. The Department will consider proposals to make appointments outside this rule. The Art Pupil Teacher during the year of his appointment must submit works for examination, *or* must sit for examination in stages other than those in which he has previously obtained success. As a rule no person over 25 years of age may be appointed Art Pupil-teacher, the appointment must be made from year to year and no prolonged tenure of it should be offered to a candidate. In no circumstances may the same person be continued in his appointment as Art Pupil Teacher for more than five years.

An Art Pupil-teachership cannot be held by a Local Scholar. (*See* pars. 46 and 48.)

The claim to a full grant under this article must be supported in each case by the Art Pupil-teacher's receipt, for the amount paid to him by the Local Committee in respect of his services for the session of 12 months prior to the May examinations; the results of which show the fulfilment or otherwise of the conditions on which the Department makes the grant for a Pupil-teacher.

In the case of Art Pupil-teachers engaged by School Boards who manage Schools of Art, the Department will make the grant to the Board under the usual conditions upon the receipt of a certificate signed by the Secretary of the Board and by the Art Pupil-teachers stating the salary they have received during the year.

Students who pass the examinations, or who send a satisfactory year's work, are considered to have been satisfactorily taught.

Payments for National Scholars.

(*c.*) 5*l.* for every student taught in the School or class who obtains a Royal Exhibition or a National Scholarship, or is admitted as a Student in Training to the National Art Training School (*see* pars. 46 and 60).

REWARDS TO STUDENTS.

Certificates.

34. A candidate who obtains an Excellent, or a 1st or 2nd Class in any subject of the Examinations receives a card or certificate recording his success.

Prizes.

35. A small number of Queen's prizes is given to those students who do best in the Examinations in the subjects stated in par. 18 on

p. 72, and par. 27, pp. 73 and 74, provided that they are registered students in a School under the Department, and have received at least 20 lessons from a qualified teacher within the two preceding years in the subject in which the prize is claimed.

National Competition, medals and prizes in.

36. Medals and books are awarded for the best of the works selected for the National Competition, *see* par. 28, p. 74.

37. About 12 gold, 60 silver, and 100 bronze medals are awarded in the National Competition.

The gold medals are usually given in the following subjects :—

(*a.*) One for a drawing from the nude living model, without a background. The drawing must not be less than 24 inches high, on an imperial sheet of paper. (Subject $8c^2$.)

(*b.*) One for a similar drawing from a single antique statue. (Subject $8b^2$.)

(*c.*) One for a figure modelled and cast in plaster, to be about 30 inches high, from a full size single antique statue. (Subject $19b^2$.)

(*d.*) One for a drawn or painted study, about 30 inches high, of drapery arranged on a living model, statue, or lay figure.

(*e.*) One for a painting of head or nude figure from nature, which must fairly fill a sheet, canvas, or panel 30 inches by 24 inches. (Subjects 17*b* and 17*e*.)

(*f.*) One for a painting in monochrome, about 30 inches high, from a single antique statue. (Subject 16*a*.)

(*g.*) Five for designs in Subjects 23*b*, 23*c*, 23*d*, 23*e*, 23*f*; and

(*h.*) One for a work not included in any of the foregoing subjects. [This medal will be given by preference for a modelled head or figure in relief suitable for a medal or medallion.]

No Student will be eligible to receive a gold medal unless he has obtained at the personal examinations held in the May of some previous year a 1st Class in the Advanced Stage of the same (or analogous) subject as that of his work entered for National Competition. Corresponding success at the 3rd Grade Examinations, which were held before the adoption of the Advanced Stage, will be counted in lieu of success in the Advanced Stage.

The silver and bronze medals are usually awarded in the foregoing and other subjects.

Candidates not eligible for prizes.

38. The number of medals and prizes is increased or decreased according to the merit of the works sent for examination.

39. The following are not eligible for medals or prizes :—

(*a.*) a student who has previously received a medal or prize for the same, or a higher success, in the same subject, except as provided in par. *43*;

A certificate recording his success is given to a Student who is precluded by this rule from receiving an award.

(*b.*) a teacher recognised as qualified for payments on the results of instruction under the Department *in the subjects for which the award is announced*;

(*c.*) a person who is or has been a Student in Training, or National Scholar; or who is a Free Student at the National Art Training School.

40. The prizes must be claimed on Form No. 571D.

41. In large towns the local committees may be empowered to make their own arrangements for obtaining the prizes if, when sending in the claim for them (Form No. 571D), they intimate in the special certificate thereon their desire to adopt this course. The Department will then pay to the local committee the value attaching to each prize gained, and furnish one prize label for each class of book prize (Queen's or National Competition) obtained by a student; and the committee must undertake to procure books, &c. for their students to the value of each prize, as stated on p. 2 of Form No. 571D.

The Department cannot undertake to examine specially for local prizes. Where it is desired to give such prizes according to the judgment of the Department's Examiners, the local prize scheme should be so arranged as to adjust itself to their usual awards.

Restrictions on award of medals and prizes.

42. Students who obtain more than one medal of the same class in the same year, or in succeeding years, receive books, &c. instead of a second medal of the same class.

43. The award of a Gold, Silver, or Bronze medal or a book prize may be made to a student once in the National Competition in each of the Subjects 23*a*, 23*b*, 23*c*, 23*d*, 23*e*, 23*f*.

44. Students who gain medals or prizes for works may be required to pass an examination in the subject for which they have been awarded.

Free Studentships in School of Art.

45. A FREE STUDENTSHIP is granted to any student in a School of Art under the Department who, being a draughtsman, designer, modeller, or handicraftsman, has (1) gained a first class in the immediately preceding personal Art Examinations in the Advanced Stage or a first class in subjects not divided into stages, and on account of whose works a payment of at least 2*l.* has been awarded at the preceding annual examination (2) attended the School of Art for two consecutive years, (3) is prepared to attend regularly for the year following the date of his appointment, and (4) is recommended by the local committee of the school, who undertake to admit him to the school without payment of fees for that year. The Department may, however, exceptionally award free studentships to other deserving students recommended by a local committee.

Local Scholarships, Royal Exhibitions, and National Scholarships.

46. LOCAL SCHOLARSHIPS, ROYAL EXHIBITIONS, AND NATIONAL SCHOLARSHIPS.—The following are open to British subjects, and are awarded in Competition as stated below:—

SIXTY LOCAL SCHOLARSHIPS, 20 open each year, at Local Schools of Art under the Department.

THIRTY ROYAL EXHIBITIONS, 10 open each year, to the National Art Training School or the Metropolitan School of Art, Dublin.

From Twelve to Twenty NATIONAL SCHOLARSHIPS, *not less than*

six nor more than ten are open each year, to the National Art Training School and South Kensington Museum.

47. No candidate can obtain both a Royal Exhibition and a National Scholarship; nor can he hold a Local Scholarship with either. But the past or present holder of a Local Scholarship may compete for a Royal Exhibition or a National Scholarship, and the Local Scholarship will determine as soon as the holder enters on the Royal Exhibition or National Scholarship.

48. A LOCAL SCHOLARSHIP is tenable for three years, with a maintenance allowance of 20*l.* a year, at any School of Art under the Department which is open at least three days and five nights a week, and which will remit the fees for instruction of the holder. The Scholar must attend a School of Art during at least 40 weeks in the year for 30 hours each week, of which 18 hours at least must be in the day. The Scholarship commences on the date at which the School, where the Scholarship is tenable, re-opens after the Summer vacation in each year. The maintenance allowance is paid quarterly, on the receipt of a certificate from the Master and Secretary of the School of Art that the Scholar has attended regularly and pursued his studies satisfactorily.

49. A ROYAL EXHIBITION is tenable for three years, and entitles the holder to free admission to the National Art Training School at South Kensington or the Metropolitan School of Art, Dublin, for the session of about 42 weeks each year, and during that time to a maintenance allowance of 25*s.* a week and third-class railway fare for one journey to and fro, each session, between the home of the Scholar and London or Dublin.

50. The Royal Exhibitions are held on the condition that the Exhibitioner regularly attends the course of instruction laid down for him, complies with the rules laid down for his guidance, and makes satisfactory progress.

51. The Local Scholarships and Royal Exhibitions are only open to students on account of whose instruction payments on results can be made, *see* § XXXII. The Competitor for a Local Scholarship must be under *22* years of age, and the Competitor for a Royal Exhibition under *25* years of age, on the 1st May of the year in which he competes.

52. A candidate who is eligible in respect of age may compete for both a Royal Exhibition and a Local Scholarship, and, if successful for both, will be allowed to choose which he or she will hold.

53. Art Teachers in Training and National Scholars, past or present, are not eligible for Local Scholarships or Royal Exhibitions. A Student holding an Art Pupil-teachership cannot also hold a Local Scholarship. Competitors for Local Scholarships or Royal Exhibitions must send in Form No. 1181 before the 15th April, and Form No. 1,202 before the 10th June.

54. The Competition for the Local Scholarships and the Royal Exhibitions is determined on the results of the May personal Examinations in Art of the year, and previous successes are not counted.

55. Candidates may sit for examination in any or all of the specified subjects except when two examinations are held on the

same evening (see paragraph 18). Candidates who may have previously passed examinations in any of the specified subjects, or in corresponding subjects, may sit again for the purpose of earning marks in the Competition.

56. The subjects of Examination with the maximum number of marks obtainable towards these Scholarships and Exhibitions are :—

Freehand Drawing of Ornament (Advanced Stage)	100 each.
Model Drawing (Advanced Stage)	
Drawing in Light and Shade from a Cast (Advanced Stage)	
Perspective (Elementary Stage)	
Anatomy	
Principles of Ornament (Advanced Stage)	140 „
Architecture	
Painting in Monochrome	180 „
Painting Still Life	
Historic Ornament	
Drawing the Antique from Memory	
Drawing from the Antique	200 „
Drawing from Life	
Design—Subject 23c (Advanced Stage)*	
Architectural Design	
Design—Subject 23d (Honours)*	
Modelling from Life	
Modelling from the Antique	
Modelling Design (Advanced Stage)*	
Modelling Design (Honours)*	

But the number of marks gained by the Candidate in each subject is diminished by the number required to pass in that subject. The remainders are then added together to determine the Candidate's position.

57. A NATIONAL SCHOLARSHIP is tenable for two years, and in special cases may be renewed for a third, *but a candidate's appointment to it is from session to session.* The Scholar receives a maintenance allowance at the rate of 25*s.* a week for the Session of about 42 weeks each year, and third-class railway fare for one journey to and fro, each session, between his home and the National Art Training School, London.

58. Only Students of Schools of Art who are engaged in trades which depend upon decorative Art are eligible to compete for National Scholarships. The selection will be made by giving due weight to the nature and requirements of the trades represented by the Candidates, to the evidence they give of special aptitude for design, and to the progress they have made at the Schools at which they have studied as shown by the works they submit and the Examinations they have passed. Applications must be made on Form No. 488, accompanied by drawings, designs, and other evidence of the Candidate's ability before the 20th July.

59. The National Scholar will be required to prosecute a course of studies, laid down for him by the Director for Art, in the Museum

* Candidates cannot sit for both the Advanced Stage and Honours in these subjects.

and National Art Training School, and will only hold his Scholarship so long as he pursues his studies diligently, and shows satisfactory progress.

60. Studentships in Training at the National Art Training School are open to competition among students of Schools of Art who hold the Art Master's Certificate, Group I. *See* par. 6, p. 83.

Princess of Wales' Scholarships.

61. "PRINCESS OF WALES'" SCHOLARSHIPS.—Two scholarships, of about the value of 25*l.* and 11*l.* respectively, are open to competition each year and are awarded to the two female students of School of Art who take the highest prizes (not Honorary Awards) of the year in the National Competition. These Scholarships date from the 1st October in each year, and are tenable for one year in the School of Art only where they have been gained. The scholarships are not awarded to the same persons for more than three years in succession. Students in Training, National Scholars and Free Students of the National Art Training School, past or present, are not eligible for these Scholarships.

Each "Princess of Wales' Scholar" is required to present half-yearly reports of the course of study she has pursued at her School of Art during her tenure of the scholarship. These reports must be sent through the Secretary of the School of Art in which the scholar is studying, on the 31st of March and 30th of September. A moiety of the sum awarded will be paid on the receipt of each report if it be satisfactory.

GRANTS FOR TRAVELLING TO MASTERS AND STUDENTS.

Art Masters' visits to London, Foreign Towns, &c.

62. Grants will be made to enable a limited number of masters and students of SCHOOLS OF ART *and Art Classes* to see the works in the National Competition exhibited at South Kensington; to visit and study in the South Kensington Museum, the National Art Training School, and other Institutions; and, in special cases, Foreign Towns, Schools, and Galleries, to study and make sketches of buildings and of objects in museums; or to study in any approved centre of Art instruction. They may be required to do special work for the Department.

Application must be made on Form No. 1178 *not later than* 30*th June.*

Travelling expenses.

63. The travelling expenses which may be allowed to Teachers and Students are third class railway fares and not more than 7*s.* 6*d.* a night while required to be absent from home; but no cab or omnibus fares unless they are travelling in the service of the Department, when they are allowed 2nd class railway fares and 10*s.* personal allowance per night while required to be absent from home.

Vacation course of Art instruction.

64. Short courses of instruction in Modelling, Design, and Drawing from the Life for a limited number of Teachers and Advanced Students are given in the National Art Training School and South Kensington Museum. Application for admission to these courses must be made on Form No. 234 before the 30th of June. The candidates selected will receive third class railway fare for one journey to and fro between their homes and the National Art Training School, and 3*l.* towards their expenses while attending the courses.

NATIONAL ART TRAINING SCHOOL, LONDON, S.W.

1. THE NATIONAL ART TRAINING SCHOOL is established for the purpose of training Art Masters and Mistresses for the United Kingdom, and for the instruction of students in Drawing, Painting, Modelling, and Designing, for Architecture, Manufactures, and Decoration. — Object of the National Art Training School.

2. Free admission to the courses of Instruction is granted to Students in Training, National Scholars, and Free Students (*see* pars. 6 to 14). Admission is also granted to the general public on payment of fees (*see* par. 17). — Admission to School.

3. The School is open for study every week-day, except Saturday. Day Classes from 9 a.m. to 4 p.m., with an interval of half an hour for lunch; evening classes from 7 p.m. to 9 p.m. for male students, and from 6.30 to 8.30 for female students, except during the months of May, June, and July, when the evening classes meet from 6 to 8 p.m. Life classes and class lectures commence at 10 a.m. and close at 3.30. p.m. — Hours of study.

4. The Annual Session consists of two terms, each lasting five months, and commencing on the 1st Wednesday of October and the 1st of March, and ending on the last day of February and the last Friday of July respectively. — Terms.

5. Vacations for the session 1894–1895 :— — Vacations.

The School re-opens after the Long Vacation, 1895, on Wednesday, 2nd October. Christmas, the School closes 3 p.m., Monday, 23rd December 1895, and re-opens 9 a.m., Tuesday, 7th January 1896. Easter, the School closes Thursday, 2nd April, and re-opens Wednesday, 8th April. Whitsuntide, the School closes Friday, 22nd May, and re-opens, Wednesday, 3rd June. Long Vacation, 1896, the School closes Friday, 31st July, and re-opens Wednesday, 7th October. Christmas, the school closes 3 p.m., Wednesday, 23rd December 1896, and re-opens 9 a.m., Tuesday, 5th January 1897.

FREE STUDENTSHIPS, NATIONAL SCHOLARSHIPS, &c.

6. STUDENTSHIPS IN TRAINING AT THE NATIONAL ART TRAINING SCHOOL.—Students of Schools of Art (whether men or women) who have taken the Art Master's Certificate, of the 1st Group, and are preparing to become Teachers, are eligible to compete for admission to the training class of the National Art Training School, with a maintenance allowance at rates of from 12*s.* 6*d.* *to* 43*s.* 6*d.* a week for the session of about 42 weeks each year and 3rd class railway fare for one journey to and fro, each session, between the home of the student and the National Art Training School. They must attend *the courses of instruction prescribed for them by the Department.* They may be required to perform certain duties as teachers, and must engage to accept the situations to which they may be recommended. They are not at liberty to accept situations without first obtaining the consent of the Principal. Applicants for admission must fill up and send in Form No. 488 before the 15th January or the 20th July. Students who have been on the list of paid Students in Training or National Scholars, and who retire with credit, may continue to study in the School as Free Students for one year, and this Free Studentship may be renewed on the conditions laid down in paragraph 28 (*b*) of this Prospectus. — Studentships in training.

7. Allowances to Students in Training are renewable from Term to Term; but no male Student may remain on the list of paid Students for more than four years, and no female Student for more than two years, without the sanction of my Lords on a special recommendation; and no Student may remain even that time unless he or she does well from Term to Term. — Allowances to students in training.

8. ROYAL EXHIBITIONS AND NATIONAL SCHOLARSHIPS.—*See* pars. 46, &c., p. 79. — Royal Exhibitions and National Scholarships.

9. Students in Training and National Scholars may, in special cases, receive grants in aid of their travelling expenses in visiting Foreign Schools and Galleries. They may be required to do special work for the Department. — Grants for students' travelling expenses.

10. The Department reserves the right to retain works done in the School by Students in Training or National Scholars.

11. Should the conduct or progress of National Scholars or Students in Training be unsatisfactory their allowances may be reduced or wholly withdrawn. — Subject to disallowance.

Admission of students of the Royal Academy; of the Royal School of Art Needlework; of the School of Wood Carving.

12. ADMISSION OF STUDENTS OF THE ROYAL ACADEMY TO THE NATIONAL ART TRAINING SCHOOL.—Students of the Royal Academy who desire to become Teachers, and who have attended the Life Class or Upper Division of the Architectural Class there for six months during the last three years, or persons who have been students at the Royal Academy within the last three years, are qualified for admission to the Training School, and to receive an allowance of 15*s.* per week for the 42 weeks of the session. This allowance will be withdrawn if the student does not succeed in obtaining the Art Class Teacher's Certificate, and completing the examination for the Art Master's Certificate, Group I., within the period of three terms.

STUDENTS OF THE ROYAL SCHOOL OF ART NEEDLEWORK who desire to avail themselves of the instruction in the National Art Training School are admitted on payment of a fee of 1*l.* per term of five months for one day per week.

STUDENTS OF THE SCHOOL OF WOOD CARVING who wish to attend the lectures on Design are admitted without entrance fee and at half the fee for the course of lectures.

Other free studentships.

13. FREE STUDENTSHIPS AT THE NATIONAL ART TRAINING SCHOOL.—Industrial Students in a School of Art who have paid fees for one year, and are prepared to become Teachers, Manufacturers' Draughtsmen, Designers, or Art workmen, are entitled, after taking the Art Class Teacher's Certificate, and within 12 months from the date when they became qualified to apply for the certificate, to apply through the Secretary of their Schools for free admission for two consecutive terms to the National Art Training School. This free admission may be renewed for the two terms next following those for which it was first granted, provided that the Student obtains the Art Master's Certificate, Group I., or an Honorary award in the National Competition, or a first class in the advanced stage, in two or more subjects of the May Examinations, of which one must be the Principles of Ornament, held during the period for which the grant of free admission to the National Art Training School is made to him.

Free admission for short periods may be exceptionally granted to specially qualified persons, and to Teachers of Schools of Art who are specially recommended by their Committees.

Free studentships for modellers. Renewal.

14. Three free studentships for Modellers, tenable for one year, are open to competition by Students of Art Schools who execute successfully a model of a head from the antique. The competition for these Studentships takes place on the second Wednesday in July and following days at the School. They may be renewed for a second year on taking the Art Class Teacher's Certificate or an Honorary award in the National Competition.

AWARDS and GRANTS to NON-FEE-PAYING STUDENTS.

Travelling scholarships.

15. THREE TRAVELLING SCHOLARSHIPS of 50*l.* yearly each are offered for competition among the National Scholars, Students in Training, and Free Students. A travelling Scholarship cannot be held a second time by the same Student.

Honorary awards.

16. HONORARY AWARDS only are made to Free Students, National Scholars, and Students in Training, in respect of successes gained by them at the Examinations, and in the National Competition.

DIVISION FOR STUDENTS PAYING FEES.

[FEES MUST BE PAID BEFORE ADMISSION TO ANY OF THESE CLASSES CAN BE GRANTED.]

Admission on payment of fees.

17. The scale of fees for the admission of the general public to the Schools is as follows:—

	£	s.	d.	
The payment of	5	0	0	per term entitles a Candidate to admission to the School for 5 months for both day and evening classes.
The payment of	1	0	0	per month (*without entrance fee*) entitles Governesses in private schools or families to attend *the* day *and evening* classes for three months in any one calendar year.
				DAY CLASSES.
The payment of	1	1	0	per term entitles a Candidate to admission to a special Architectural Class held on Tuesdays.
The payment of	1	1	0	per term entitles a Candidate to admission to a Special Designing Class on either Mondays or Tuesdays. (The fee is 2*l.* 2*s.* for both days.)

In addition to these fees an entrance fee of 10*s.* is chargeable to a Student on first joining the day classes, or on rejoining them after an absence of a year; but it is not chargeable to Free-students, or to Students who, after admission to the School as Free-students or Governesses, may change their position and become Students paying these fees, except after a year's absence.

EVENING CLASSES.

£	s.	d.	
The payment of 2	0	0	per term of five months entitles a Candidate to admission every evening, except Saturdays. (For Male Students.)
The payment of 1	0	0	per term of five months entitles a Candidate to admission on Tuesdays, Thursdays, and Fridays (for female Students) from 6.30 to 8.30 p.m., or from 6 to 8 p.m.
The payment of 0	5	0	per term entitles Schoolmasters, Schoolmistresses, and Pupil-teachers of Public Elementary Schools to attend on any two evenings in each week, on one of which instruction in Blackboard drawing and demonstration will be compulsory.

AN EVENING ARTIZAN CLASS

is held in the Elementary Room, for the Elementary Stages of Freehand Drawing, Model Drawing, Drawing in Light and Shade from a Cast and Section I., Science Subject I.

The payment of 0	15	0	per term or 5s. per month entitles a Candidate to admission for five evenings weekly.
The payment of 0	10	0	per term or 3s. per month entitles a Candidate to admission for three evenings weekly.

Students of this Class who have paid fees in it for two consecutive terms, and have passed in all subjects of the 2nd Grade Certificate or Elementary Drawing Certificate (First Class), and Schoolmasters and Mistresses who hold the Elementary School Teacher's ("D") Certificate or Elementary Drawing Certificate (First Class), may also work in the general class-rooms at the same fees as an evening artizan student.

Students desiring to continue their attendance at the Schools for a short period beyond that covered by the fees they have paid, may be *exceptionally* allowed to do so upon the recommendation of the Principal, coupled with the payment of monthly rates according to the usual scale.

Pass in Freehand Drawing required for admission.

18. Students who have passed the 2nd Grade examination in Freehand Drawing or have obtained corresponding or higher successes in a similar subject at the Art examinations of the Department may join the School at any time during the session, on payment of fees for not less than five months. At the end of the five months, if there be less than five months between that time and the end of the session in July, the student may remain until the end of the session on payment of a proportional fee for each week unexpired up to the last Friday of July. The months of August and September, being the vacation, are not counted as part of the five months paid for.

19. Students who have not passed an Examination in Freehand Drawing cannot be admitted until they have passed the admission Examination. Examinations for admission are held weekly at the commencement of each term, and at frequent intervals throughout the year at the School, on Tuesdays, at 11.45 a.m. and 6.45 p.m., except in the months of May, June, and July, when the evening examination takes place at 5.45 p.m. The examination fees are 2*s.* 6*d.* for day Students, and 6*d.* for evening Students, to be paid at the time of examination. Candidates should bring their own lead pencils and india-rubber. Unsuccessful candidates cannot be re-examined until after a month's interval. Students who are engaged in the Building Trades may, on producing a certificate to that effect from their employers, join the Architectural Class without passing this admission examination. Success at the admission examination does not count towards any certificate.

Admission Examinations during 1895–96 will be held as under:—

Dates of admission Examinations.

1895.	
June 18th and 25th.	October 8th, 15th, 22nd, and 29th.
July 23rd.	November 5th and 26th.
September 24th.	December 17th.

1896.	
January 7th, 14th, and 28th.	July 28th.
February 4th, 11th, 18th and 25th	September 29th.
March 10th and 31st.	October 6th, 13th, 20th, and 27th.
April 14th and 28th.	November 10th and 24th.
May 5th.	December 15th.
June 9th and 30th.	

Register of attendance.

20. A REGISTER of the Students' attendance is kept, and may be consulted by parents and guardians.

21. Students, unless they obtain leave of absence, must remain in the Schools until 3.30 p.m., except during the half-hour for lunch, viz., from 1 to 1.30 for male Students, and from 12.30 to 1 for female Students.

Courses of instruction.

22. THE COURSE OF INSTRUCTION for Students who are not in receipt of allowances, nor working for Art Certificates applies to Ornament

and the Figure with a view to their ultimate use in design and composition, and includes the study of plants and flowers, the painting of Still-life, and the drawing and painting of Ornament, and of the Figure; and all Students who have not done so, are expected to pass the Department's Examination in the Principles of Ornament as soon as possible after entering the School.

23. In following out the Courses of Instruction, Students are required to pass, with the approval of the Principal, in the following subjects:—

I. Course for Students wishing to study Landscape, Still-life, and Flower Painting:

1. Elementary.—Preparatory to any study in this Course:—
   Subject 2*b*. Freehand drawing in outline from the flat if necessary (from Dyce and Jacobsthal).
   „ 3*b*. Freehand drawing in outline of ornament from the round.
   „ 11*a*. Painting in Sepia from the flat.
2. Preparatory to Painting from Nature in Oil or Water-colour:—
   Subject 10*a*. Outlining Foliage from Nature.
   Subjects 5*a* & 5*b*. Shading in Chalk from Models, Casts of Ornament, Fruit, &c.
   Subject 12*a*. Painting in Sepia, or Monochrome, or Tempera from Casts of Ornament.
   „ 13*a*. Painting Flowers, &c., from the flat.
3. Advanced:—
   Subjects 15*a* & 15*b*. Painting Flowers, groups of Still-life, &c., from Nature in Water-colour or Oil.
   Subject 13*b*. Landscapes from Copies.
   Students in this Course should attend the class lectures on Model-drawing and Plant-form.

II. Course for Students wishing to study the Figure:—

1. Elementary.—Preparatory to any study in this Course:—
   Subject 2*b*. Freehand drawing in Outline from the flat (if necessary).
   „ 8*a*. Outline drawing of details of the Face from the round.
   „ 8*a*. Outline drawing of the Head, Hands, and Feet, and whole Figure from the round.
   Subjects 5*a* & 5*b*. Shading in Chalk from Models, and Casts of Ornament.
   Before being admitted to the next Preparatory Course, Students must pass through the Model-drawing and Perspective class.
2. Preparatory to drawing from the Life:—
   Subject 8*b*1. Shading in Chalk from Heads, Hands, and Feet from the Cast.
   „ 8*b*2. Shading the whole Figure from the Antique.
   „ 9*a*. Outlines of the Skeleton, and Anatomical Figure, with the names of the Bones and Muscles.
   Students must attend the class lectures on Anatomy and pass the examination on the course.
3. Preparatory to Painting from the Life, in Oil or Water-colour:—
   Add to the above,
   Subjects 12*a* & 16*a*. Sepia, Tempera, or Monochrome painting of Ornament and the Figure from the Cast.
4. Advanced:—
   Subjects 8*c*. & 8*d*. Shading in Chalk from the living Model, nude or draped.
   „ 17*b*. Painting from the living Model, in Oil or Water-colour.
   „ 8*d* or 14*c*. Studies of Drapery drawn or painted.
   23*d*. Figure composition.

III. Course of design. (This will also be the course for those Students in Training who are working for the Art Master's Certificate, Group II.)
   Students in design, unless they have taken or are working for the Art Master's Certificate, Group I., must first follow the Elementary Course in No. I.

The advanced class is under the direction of Mr. Stannus. The Students must attend his lectures, and Mr. Hagreen's Course of Lectures on Elementary Architecture.

The course will consist—

1. Of Outline Drawing and Monochrome colouring from Jacobsthal, Meurer, Teirich, Gruner, and other works, which must be used not only as a means of studying drawing, but as a definite course of design.

2. Subject 11*b*. Painting Ornament from flat examples in Colours.
   „ 12*a*. Painting Ornament in Monochrome from the Cast.
   „ 14*a*. Studies of Plants from Nature.

3. Designing in imitation or completion of given examples.

4. Composition. Subjects 23*b*, 23*c*, & 23*d*.

IV. Modelling.

Before entering the Modelling class, Students must pass the Elementary stages in Course II., and attend the Model-drawing and Perspective lectures.

V. Etching.

Students desirous of entering the Etching Class must give evidence that they are sufficiently advanced in drawing to profit by the instruction, and obtain permission to attend.

24. Time Table of Class Lectures in the National Art Training School. Class lectures.

Day.	Morning.	Afternoon.	Evening.
Monday	(Advanced Stage) - Perspective (Advanced Stage) Class Lecture.	Design (Elementary)	Geometrical Drawing. A. C. Teachers.
Tuesday	Geometrical Drawing, Section 1, Science Subject I. Anatomy, Class Lecture Architecture, Class Lecture.	Design (Advanced) -	Perspective (Elementary Stage.) A. C. Teachers.
Wednesday	Perspective (Advanced Stage) Class Lecture.	Perspective (Advanced Stage).	Perspective (Advanced Stage). A. C. Teachers.
Thursday	Model Drawing Lecture, Advanced Stage.	Plant Drawing and Painting relating to design.	A. C. Teachers and Blackboard Practice.
Friday	Details of Human Figure.	Anatomy, Class Lecture, Analysis of Ornament (Free-hand).	A. C. Teachers.

25. Courses of Lectures and Demonstrations on Ornamental Art and on Anatomy as applicable to the Arts may be given each year as announced. The Anatomy Course may be attended by ladies. Other Lectures may be delivered occasionally. Students may apply for free admission to the Lectures. The Fees are for a single lecture 1*s*., for a course at the rate of 6*d*. per Lecture. Lectures and Demonstrations.

Prizes to Fee-paying Students.

26. For prizes open to fee-paying students, and for Medals, *see* Art, pars. 35, 36, and 37 on pp. 77 and 78. Prizes.

Privileges granted to Fee-paying Students of the National Art Training School.

Privileges granted to students.

27. Students of the National Art Training School who have paid fees for two consecutive terms in the School, and who are preparing to become teachers, manufacturers' draughtsmen, designers, or Art workmen, are entitled—

(*a.*) To attend their class for one year, on payment of half the usual fee, on passing in the Elementary Stage of Science Subject I., and obtaining a 1st class in the examinations (Elementary Stage) in Freehand, Model, and Perspective Drawing.

(*b.*) To a continuance of the same privilege for the next year only, if they pass the examination (Elementary Stage) in the Principles of Ornament at the May examinations or gain a prize in the National Competition, of the year.

(*c.*) After taking the Art Class Teacher's Certificate to free admission for one year, renewable for the next year only, provided that they obtain the Art Master's Certificate, Group I., or an Honorary award in the National Competition, or a 1st class (Advanced Stage) in two or more subjects,* of which one must be the Principles of Ornament, of the May examinations of the year.

28. Students of the National Art Training School who are preparing to become teachers, manufacturers' draughtsmen, designers, or Art workmen, and who, after having paid fees for two consecutive terms in the School, obtain the Art Master's Certificate, Group I., or a National Scholarship (*see* par. 8 of this Prospectus), are entitled—

(*a.*) To free admission for a year, provided that, in either case, they pass the examination (Advanced Stage) in Principles of Ornament; and

(*b.*) To a continuance of free admission, provided that they take annually an Honorary award in the National Competition, or a 1st class (Advanced Stage) in two or more subjects* of the annual personal Examinations.

* N.B.—The successes in respect of which free admission is continued must be different from and not lower than those previously gained by the Students concerned.

Admission of Students to Museums and Libraries.

29. All properly qualified Students of the National Art Training School are entitled to admission to the South Kensington Museum and Libraries, either for consultation or copying, as well as to all the School Lectures of the Department.

Students in Training, National Scholars, Royal Exhibitioners and other free students recommended by the Principal may be granted the privilege of borrowing books from the Students' Lending Library at the National Art Library.

Further information may be obtained on personal application to the Registrar at the Schools, or by letter addressed to the Secretary, Department of Science and Art, London, S.W.

Form No. 1294.
Art.

PART II.

GRANTS FOR DRAWING IN ELEMENTARY DAY SCHOOLS.

1. The term Elementary School includes (*a*) a Public Elementary School under the Education Department for England and Wales; (*b*) a Public or State-aided School under the Scotch Education Department; and (*c*) any other School, or department of a School, at which Elementary Education is the principal part of the education there given; but does not include any School or department of a School at which the ordinary payments in respect of the instruction, from each Scholar, exceed ninepence a week, or which is conducted for private profit. Definition.

2. With the exception of the grants for Pupil-teachers and Ex-Standard (Code) Scholars provided for in §§ 24 and 25, grants under these rules are only made on account of Scholars of Elementary Schools whose names are on the School Register and who are receiving instruction in the obligatory or standard subjects prescribed by the Minutes of the Education Department for the time being. No grants are made under these rules to Schools under the Commissioners of National Education in Ireland. Grants for Drawing.

3. No grants are made for Scholars in the Standards in Elementary Schools, as defined above, under the rules for Art Classes or Art Schools.

4. The grants may be withheld, wholly or in part, for any breach of the rules, or for any error or neglect on the part of the Managers or Teachers.

5. The Department is the sole judge as respects all grants and awards.

6. No School is placed on the list of Schools claiming grants for Drawing until an application has been addressed to the Secretary, Department of Science and Art, London, S.W., and a Form (No. 520) of preliminary statement filled up and sent to the Department by the Managers. If application for a grant is not made within six months after the date at which the teaching of Drawing is commenced, the Department may refuse to make a grant for any time previous to the receipt of the application. The application need not be renewed annually. The Managers must appoint one of their number to act as Correspondent, and give notice to the Department of any change. Members of School Boards and their Officers are Managers for the purpose of these rules. The Clerk of a School Board may act as Correspondent for all Schools under the Board. Application for aid.

7. The Drawing should be taught by a Teacher holding the Elementary School Teacher's Drawing certificate (D.), the Elementary Drawing Certificate (First Class), the 2nd Grade, or a higher, Art certificate; and if no Teacher of the School is well qualified to give instruction in Drawing, it is Teachers.

most desirable that an outside Teacher, such as the Teacher of a School of Art or Art Class under the Department, should be engaged at least to assist in the instruction. But the possession of a Certificate in Drawing on the part of the Instructor will not, for the present, be insisted on as a necessary condition of the School earning the grant for Drawing. If it should at any future time be found expedient or necessary to impose the condition that the Teacher of Drawing should hold a certificate from the Department of Science and Art, Teachers of Elementary Schools who were certificated as such and engaged in teaching before the 1st of January 1893 will be exempted from its operation. That is to say, no School will be disqualified from earning a grant for Drawing on the ground that its Teacher was not certificated in Drawing if he had been certificated as an Elementary School Teacher, and teaching as such in that or any other Elementary School, before the 1st of January 1893.

Certificates of special qualification to earn grants for Drawing.

Until 31st December 1896, certificates of qualification to earn grants on the teaching of Drawing in Elementary Schools may be granted to Teachers who do not hold the Elementary Drawing Certificate, but have taught Drawing in Schools which have obtained two or more good reports since August 1891, provided that such Teachers satisfy the following conditions :—

(1.) They must have been recognised by the Education Department as Teachers of Elementary Schools for at least seven years previous to 1st September 1891, when Drawing was made a compulsory subject of instruction for all boys in Schools for older Scholars ; and (2) they must present a certificate, if required by the Department, from the Managers of the Schools in which they have taught Drawing that instruction in that subject was given by them regularly throughout the period in which the Schools obtained the requisite reports.

Requirements as to instruction in Drawing.

8. Drawing must be taught throughout the School to all Boys in Schools for older Scholars ; but it is not essential that Drawing should be taught to Girls. Infant Schools, or Infant departments, or Infants in a School for older children, or Scholars in Standard I. or II. if taught in an Infant School, cannot be examined under these Rules, except that in Schools in Scotland, when the organisation of a School places in the Infant department children in the classes corresponding to Standards I. or II., they must be examined in drawing. The Time Table must provide for at least one hour and a half of instruction in Drawing during the week, and this instruction must be given regularly throughout the year. This last requirement is imperative in all cases ; and in half-time Schools the 1½ hours should be so fixed in the time-table that the half-time Scholars may receive instruction in Drawing for at least 1½ hours each fortnight.

Girls and drawing grant.

9. In order that the girls in (*a*) a Public Elementary School in England and Wales, or (*b*) a Public or State-aided School in Scotland, may earn a grant for Drawing, the Managers thereof must certify that the Time Table for Girls provides for the instruction of Girls in Cookery according to the rules of the Education Code.

10. The School must be open at all times to the visits and inspection of the Officers of the Department of Science and Art. Inspection.

11. The examinations are held by Inspectors appointed by the Department of Science and Art, and a room or rooms of sufficient size to hold the examination according to the regulations of the Department must be provided. As a rule the examinations of Schools under the English and Scotch Education Departments are held annually in the month next preceding that of their inspection by Her Majesty's Inspector. The examinations of other Elementary Schools are held on dates to be arranged between the Managers and the Inspectors. All changes of the month of examination must be previously approved by the Department. Dates of Examination.

12. No persons other than scholars of the School in which the examination is held may attend the examination; except as is provided in §§ 23, 24, and 28 below.

13. The Standards of examination in Drawing are as follows, and they must be taken consecutively:— Standards of examination.

Standard I. Drawing, freehand, and with the ruler, of lines, angles, parallels, and the simplest right-lined forms. (To be drawn on slates or on paper, at the option of the Managers.)

Standard II. The same on paper only.

Standard III. (*a.*) Freehand drawing of regular forms and curved figures from the flat.
(*b.*) Simple geometrical figures with rulers.

Standard IV. (*a.*) Freehand drawing from the flat.
(*b.*) Simple scales and drawing to scale.

Standard V. (*a.*) Freehand drawing from the flat.
(*b.*) Drawing from rectangular and circular models, and from easy common objects.
(*c.*) Geometrical figures with instruments and to scale.

Standard VI. (*a.*) Freehand drawing from the flat.
(*b.*) Drawing from models of regular forms and from easy common objects.
(*c.*) *Geometrical drawing more advanced than in Standard V.**

Standard VII. (*a.*) Freehand drawing from the flat.
(*b.*) *Drawing from models of regular forms and from easy common objects, more advanced than in Standard VI.; or*
or
(*c.*) Drawing any common objects and casts of ornament in light and shade.
(*d.*) Geometrical drawing more advanced than in *Standard VI.*; or*
or
(*e.*) Plans and elevations of plane figures and rectangular solids *in simple positions*, with sections.*

N.B.—In order to interest the scholars it is advisable to teach them to draw as early as possible from *such common objects as are easily available.* It will also be found quite possible and very desirable to go beyond the foregoing standards in teaching. Thus freehand drawing of bold curves may be introduced in Standards I. and II.; and exercises may be advantageously given, in all standards, in drawing from memory.†

14. The classification for instruction in Drawing need not correspond with the ordinary Standards of instruction in the School. But where Standard I. (Code) is taught in the Infant Special classification for Drawing.

* Girls are not required to take the subjects specified in Standard VI. (*c.*), or Standard VII. (*d.*) or (*e.*).

† An illustrated syllabus of the course of instruction in Drawing, *together with a scheme of instruction in Drawing for small schools, and an alternative illustrated syllabus*, may be obtained from Messrs. Eyre & Spottiswoode, East Harding Street, London, E.C.

department and there is no Standard I. (Code) for older Scholars, the examination of the older Scholars in Drawing must begin with Standard II.; and where there is a Standard I. (Code) both in the Infant department and in the School for older Scholars, the examination in Drawing of Scholars promoted from Standard I. (Code) in the Infant department to Standard II. (Code) in the School or department for older Scholars must begin with Standard II. in Drawing, which is the same as Standard I. except that the Drawing is on paper and not on slates. All Scholars must be presented for examination in the Standards in which they have been taught Drawing, and in ordinary circumstances Scholars should be advanced not less than one Standard a year.

Drawing Schedule.

15. The Managers must keep suitable registers of the attendance of the Scholars, and they must furnish the Inspector, when he examines the School in Drawing, with a Schedule in Form No. 1294D, giving the names of all Scholars on the School register, arranged in the Standards in which they are to be examined in Drawing. The Schedule must be certified by two of the Managers, or in a Board School, by the Clerk, of the School Board or two Managers appointed under section 15 of the Education Act, 1870, or under section 22 of the Scotch Education Act, 1872. Half-time Scholars must be indicated by the letters H.T. after their names. The letter L should be placed against the names of Scholars, if any, who have been admitted during the last six months preceding the examination. The Managers must keep a copy of this Schedule for the Inspector to refer to. The names of all absentees must be noted in the Schedule, with the causes o their absence certified by the principal Teacher or Teachers or by the attendance officer. The Inspector will report if any Scholars are absent without reasonable excuse. He will not inquire into the reasons for the classification of particular children if he is satisfied that the School as a whole is making fair progress in Drawing. But if he has reason to suppose that there has been any abuse of the freedom given by the present regulations,—if, for instance, low classification is attributable to neglect of the Scholars, or if the classification is such as to interfere seriously with the efficiency of the arrangements for Drawing in the School,—it will be his duty to report the matter to the Department. If the instructions with regard to the preparation of a Schedule have not been complied with the Inspector may refuse to hold an Examination and the School will lose its grant for Drawing.

Results.

16. In deciding whether the instruction in Drawing shall be marked as "Excellent," "Good," "Fair," or "Failure," the method and time of instruction, the number of half-time Scholars, the provision of examples, the presence of sickness in the district during the past year, or at the date of the Inspector's visit, irregularity of attendance from causes beyond the control of the Managers, or any other circumstances for which the Managers are not responsible, and which may affect prejudicially the progress of the Scholars, will be considered, as well as the results of the Examination.

17. In Schools in which Drawing is taken for the first time, the instruction need not, for the first year, extend beyond Standard IV. for Drawing (§ 13), or beyond Standard III. in small Schools with an average attendance, of boys and girls together, not exceeding 60. But no School will be required to take a Standard in Drawing higher, or lower, than the Standards of Elementary instruction taught in it under the Education Code, and in small Schools the instruction may be grouped for convenience of teaching so long as the various subjects are fairly taught and none are skipped. Requirements as to Standard.

18. For the examination the Managers must provide a sufficient quantity of common white cartridge paper cut in sheets of about the size of imperial octavo, or about 11 ins. by 7¼ ins. For Drawing from the Cast the same or somewhat larger paper, but not exceeding 15 in. by 11 in., either white or tinted, may be used, and for some problems in Drawing to Scale in Standard IV. there must be a supply of squared paper with lines about ⅛ of an inch apart. Squared paper may not be used for other drawings; nor may squared slates, or slates ruled with indented lines, be used by Scholars in Standard I. Paper for examinations.

19. Subject to compliance with the foregoing conditions, a grant is made of 1*s.*, 1*s.* 6*d.*, or 2*s.* for each Scholar, or, where the girls are not examined in Drawing, for each boy in average attendance, if the award be "Fair," "Good," or "Excellent," respectively. The "average attendance" during any period is the number found by dividing the total number of "attendances" by the number of times on which the School met during such period. In Schools under the English and Scotch Education Departments the attendances must be taken from the ordinary Register of the School: other Schools must keep an Attendance Register or some similar form. Grants on average attendance are only made on account of Scholars whose names are on the Register of the Elementary School. "Infants" may not be included in the "average attendance" under this regulation. In Schools in Scotland the grants are paid on the average attendance of children over 7 years of age. Amount of Grant. "Average attendance."

20. The awards to Schools under inspection are reported to the English and Scotch Education Departments.

21. The grants are in all cases paid up to the end of the School year. The School year of Schools under the inspection of the Education Departments is the year ending with the last day of the month preceding that fixed for H.M. Inspector's annual visit. The School year of Schools not under the inspection of the Education Departments ends with the month preceding that approved by the Department of Science and Art for the examination in Drawing by the Inspector. If the instruction for which the grant is made be for a period other than a year, the grant will be increased or diminished by one twelfth for each month more or less than a year; and no grant can be paid for any portion of the year during which Drawing has not been taught in full compliance with the regulations, except that if a School has been closed during the year under medical authority, Grants paid to end of School year.

or for any unavoidable cause, the grant will not be reduced under this rule.

Cards of merit.

22. Cards of merit are given to all scholars who pass with credit the 6th or 7th Standards in Drawing.

Examination of Pupil-Teachers and Ex-Standard (Code) Scholars.

Pupil-teachers and Ex-Standard Scholars (Code).

23. Pupil-teachers and Ex-Standard (Code) Scholars in an Elementary School where Drawing is taught may not be examined in the Drawing Standards (§ 13), but they may be examined in the Elementary Stages of Freehand (Subject 2*b*), and Model Drawing (Subject 3*a*), respectively; and in Drawing in Light and Shade from a Cast (Elementary Stage of Subject 5*b*), when the rest of the School is examined. The three subjects may be taken in any order, and candidates may take either or both of the Subjects 2 *b*. and 3 *a*., but no candidate for examination in Subject 5 *b*., Light and Shade Drawing, may take either of the other subjects at the same examination, and no examination can be held in Subject 5 *b*. unless the Managers of the School provide casts for the purpose in accordance with the Syllabus of Subjects of Examination under this rule.

Ex-pupil-teachers.

24. Ex-pupil Teachers remaining in the School, and whose term expires within the year following its examination in Drawing, may attend its next examination, and payments under § 25 may be made on account of their success.

Payments on Pupil-Teachers and Ex-Standard Scholars (Code).

25. Payments of 1*l*. and 10*s*. respectively for a first class or second class in the Elementary Stage of Freehand, Model, and Shading from a Cast, and of 10*s*. for a pass in Geometrical Drawing (*Art*), are made on account of each Pupil-Teacher or Ex-Standard Scholar of the School who has been taught Drawing in the School; but Pupil-Teachers and Ex-Standard Scholars can only be examined in Geometrical Drawing at the May examinations of Science and Art Schools and Classes.

Higher Grade Schools.

26. Grants are not made under the foregoing rules (§§ 19 and 25) for Scholars in a Higher Grade School who are not in the Standards of the Education Code or whose names are not on the Register of the Elementary School. Provision can only be made for their instruction and examination in Drawing under the rules for Art Classes.

27. No payment is made on account of a candidate for whom payment has been previously made for the same or a higher success in the same subject; and the payment for a First Class is reduced by the amount which has been previously paid on account of the same Candidate for a Second Class in the same subject.

Examination of Teachers.

28. Teachers and Assistant Teachers of Schools in places where there is no School of Art may, with the permission of the Managers, be examined in the Subjects named in § 23 at the examinations held under these regulations.

Form No. 1294 n.
Art.

GRANTS FOR DRAWING IN EVENING CONTINUATION SCHOOLS IN ENGLAND, WALES, AND SCOTLAND.

Annual grants for Drawing are made by the Science and Art Department to Evening Continuation Schools in England, Wales, and Scotland, under the following conditions:—

1. The course of instruction in Drawing in Evening Continuation Schools may be in accordance with the appended Syllabus, or with one submitted by the Managers and approved by the Department.

How to obtain aid.

2. Managers desiring to have the scholars examined in Drawing must apply for an examination (on Form No. 520 n.) annually, to the Department of Science and Art. Schools beginning work before Christmas should apply before 1st of October, and Schools beginning work after Christmas should apply before 1st of January. They must define exactly on the Form No. 520 n. the part or parts of the Syllabus which the School may have adopted in which the scholars are to be examined. The examination may be held on any evening that may be arranged by the Inspector with the Correspondent of the School. The examination of the Evening Continuation School in a remote district should, if possible, be held on the same day as that of the Day School, so as to avoid the necessity of a second visit from the Inspector. The Inspector may make arrangements for the collective examination, at some convenient centre, of the scholars of two or more Evening Continuation Schools which are in the same neighbourhood, especially if the numbers be small.

Paper for examinations.

3. For the examination the Managers must provide common white cartridge paper cut in sheets of about the size of imperial octavo, or about 11 inches by 7¼ inches. For Drawing with instruments and from the Cast, the same or somewhat larger paper, but not exceeding 15 inches by 11 inches, either white or tinted, may be used.

Inspector's visit.

4. The Inspector will, on the occasion of his visit, set the work to be then done by each Scholar, in order to test him in the portion of the Syllabus in which he has been instructed, as indicated on the Form No. 520 n. The work done under these conditions will be sent by the Inspector to the Department with his report.

Drawing schedule.

5. The Managers must furnish the Inspector, when he examines the School in Drawing, with a schedule in Form No. 1274, giving the names in alphabetical order of all scholars who are presented for examination. There must be a separate schedule for each school when two or more Schools are examined collectively.

Cards of merit.

5a. Cards of merit will be given to Scholars who pass the examination with credit. Candidates for cards of merit must each work exercises in two subjects of the Syllabus, and the exercises of each Candidate must be pinned or otherwise fastened together. The Teacher will select these Candidates, and the letter M must be placed against their names in the Examination Schedule (Form No. 1274).

Results.

6. In deciding whether the instruction in Drawing shall be marked as "Excellent," "Good," or "Fair," the Inspector's general observations upon the instruction, the provision of examples, etc., will be considered by the Department, as well as the work done before him.

Amount of grant and conditions of payment.

7. A grant of 1*s.*, 1*s.* 6*d.*, or 2*s.*, according as the award to the School is "Fair," "Good," or "Excellent," respectively, is made for each scholar, provided that the Managers certify that—

(*a.*) the scholar has not been examined in Drawing under the rules of the Department of Science and Art within the three months preceding his examination in Drawing at the Evening Continuation School;

(*b.*) the scholar has received at least 20 hours' instruction in Drawing in the School year* at the Evening Continuation School;

(*c.*) the School has met not less than 30 evenings in the School year*;

(*d.*) each scholar on whom the Drawing Grant is claimed has received at least 12 hours' instruction in one of the other subjects recognised by the Education Department under Article 2 of the Evening Continuation School Code† and Article 2 of the corresponding Code for Scotland.

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* The "School year" is the year ending on the 30th of April.—Evening Continuation School Code, Article 9.

† The following are the subjects named in Article 2:—

(*a.*) Elementary Subjects
- Reading or Recitation, or both combined.
- Writing and Composition.
- Reading and Writing combined.
- Arithmetic.

(*b.*) English Subjects
- English.
- Geography.
- History.
- The Life and Duties of the Citizen.

(*c.*) Languages
- French.
- German.
- Welsh (for scholars in schools in Wales).
- Latin.

(*d.*) Mathematics
- Euclid.
- Algebra.
- Mensuration.

8. The annual grant becomes due at the end of the School year, and is paid, upon the receipt by the Department of the claim for it from the Managers, as soon as may be after that date. Grant paid to end of School year.

9. No scholar may be presented for examination unless— Conditions of examination.

(*a.*) provision for teaching Drawing during at least one hour each week be made in the time-table;

(*b.*) a separate attendance register for Drawing be kept. In England and Wales this register should be similar to the one kept for each subject as prescribed by Art. 7 of the Evening Continuation School Code. In Scotland the Managers should provide a suitable register. Register of attendance.

The register must be marked before the beginning of each lesson, unless the number of scholars renders exceptional treatment necessary, in which case a special plan for registration must be submitted to the Department for approval. If any scholar registered as attending is withdrawn before the end of the lesson, the entry of attendance should be at once cancelled. The register must show clearly the number of hours' instruction received by each scholar in Drawing. No lesson of less than half-an-hour in length is recognised for purposes of registration.

10. No scholar may be entered or retained on the register who is under 14 years of age, unless such scholar (*a*) has been presented for examination in the three elementary subjects in Standard V. or in a higher Standard, or (*b*) is exempt from the legal obligation to attend the Elementary Day School.

11. The School must be open at all times to the visits and inspection of the Officers of the Department of Science and Art. Inspection.

(*e.*) Science Subjects and Subjects of practical utility.
- Elementary Physiography.
- Elementary Physics and Chemistry.
- Science of Common Things.
- Chemistry.
- Mechanics.
- Sound, Light and Heat.
- Magnetism and Electricity.
- Human Physiology.
- Ambulance.
- Hygiene.
- Botany.
- Agriculture, Horticulture, Navigation — in suitable localities.
- Book-keeping.
- Shorthand.

(*f.*) Vocal Music.

(*g.*) Subjects for Girls and Women only.
- Domestic Economy.
- Needlework.

Instruction may be given in other subjects, if sanctioned by the Education Department.

Syllabus for Drawing in Evening Continuation Schools.

Explanatory Note.

The objects of the course of instruction in Drawing in Evening Continuation Schools should be both to provide scholars who have not had an opportunity of going through the entire course of Drawing in the Elementary School with the means of perfecting themselves in the elementary drawing therein provided for, and to assist such scholars or others to carry that instruction forward. A sample syllabus is given below, but Managers are not restricted to it. They may propose a syllabus or scheme of their own. Such alternative syllabus or scheme must be submitted to and approved by the Department of Science and Art before being adopted for use.

Drawing Materials, etc.

The materials to be used in Drawing may be lead pencil, chalk, and water colours. The use of water colours should not be attempted until some mastery in drawing with the pencil and chalk has been acquired.

Practice in drawing with compasses, scales, rulers, curves, and such like instruments should be concurrent with freehand drawing.

The drawings may be done either from flat examples or from actual objects and things, and should be done in outline first of all; the representation of effects of light and shade may be practised subsequently.

Course of Instruction.

The course is divided into sections for the convenience of Managers, but any parts of the course may be proposed.

Section A.

(1.) Freehand drawing in outline from flat examples of ornamental forms and objects composed of straight and curved lines*; with a pencil or chalk; with a brush and tint of colour.

(2.) Drawing in outline with rulers and compasses, enlarged or reduced copies of diagrams of geometrical figures,† and of objects of simple geometrical construction,‡ such as simple forms of Building or Machine Construction: and learning how to take measurements of such simple objects.

Section B.

(1.) Freehand Drawing in outline from simple objects; (*a*) having straight lines, such as a salt-box, a ladder; (*b*) having curved

* These might be similar, if the Managers desire, to those in Standards IV and V. of the Elementary School Illustrated Syllabus.

† As in Standards IV. and V.

‡ As in Standards IV. and V.

lines, such as a flower-pot, a jug with handle; (*c*) having straight and curved lines combined, such as a wheelbarrow, an arched doorway, or single flowers and fruits and large leaves.

(2.) Drawing in outline with rulers, scales, and compasses (plans, elevations, and sections) from measurements made by the student himself of actual objects of simple construction, such as a box, a panelled door, three or four steps in a flight of stairs.

(3.) Drawing in outline with rulers, scales, and compasses from diagrams of machines or parts of machines more complicated than those in A. (2): and practice in the representation of varying tones of shadow, and of different materials in building constructions, by lines, and by tints of colour.

Section C.

(1.) Freehand Drawing in outline from Casts of architectural mouldings, and ornamental forms: or from real fruits, flowers, or plants.

(2.) Drawing in outline with Instruments from Measurements (plans, elevations, and sections) of mechanical objects, such as a cog-wheel, a tap, a door-lock, and chain.

Section D.

(1.) Freehand Drawing in light and shade, with pencil and chalk, from simple objects of domestic use, sprays of foliage, flowers, and fruits, and casts of architectural mouldings, and ornamental forms.

(2.) Practice in arranging colours, by tinting freehand outline drawings of ornament, with not more than 4 flat tints of colour.

(3.) Tinted and shaded drawing with instruments, in ink, tints of colours, etc. (plans, elevations, and sections) from measurements and specifications of objects of simple construction.

Section E.

Freehand drawing in light and shade, with brush and water colours, from objects as in D. (1).

Form No. 813.
Manual Instruction.
(*Revised to June* 1895.)

Grants for Manual Instruction in Elementary Schools and in Organised Science Day Schools.

Grants.

1. Grants are made by the Department of Science and Art towards the maintenance of classes for Manual Instruction in connexion with Elementary Schools in which Drawing is taught under the rules in Form No. 1294; or in connection with organised Science Day Schools.

2. The Department is the sole judge as respects all grants and awards. (*See* pars. 6, 7, and 8 below.)

Time and nature of instruction.

3. The instruction must be—

(*a*) carried on continuously throughout the school year for two hours weekly;*

(*b*) in the use of the ordinary tools used in handicrafts in wood or iron;

(*c*) given out of school hours† in a properly fitted workshop; and

(*d*) connected with the instruction in drawing, that is to say, the work must be from drawings to scale previously made by the scholars.

The intention of the rule laid down in par. 3 (*a*), is that the Manual Instruction should be given continuously throughout the School Year for two hours weekly, to all Scholars in respect of whom a grant is to be claimed; and that Scholars in respect of whom a grant is to be claimed, but who are in attendance on the ordinary instruction for a part only of the School Year, should also receive manual instruction for two hours weekly throughout the whole period of their attendance on the ordinary instruction.

Teachers.

4. The instruction may be given by one of the regular teachers of the School, or centre at which the Manual Instruction is given, if he is sufficiently qualified; if not, he must be assisted by a skilled artisan, and care must be taken to make such arrangements as will insure the maintenance of good order and discipline.

Inspection

5. The work of the class will be examined by an Inspector of the Department, accompanied, if necessary, by an artisan expert, on the occasion of his visit to examine in drawing.

Conditions of aid.

6. If it appears that the school is properly furnished with plant for instruction, and that the instruction is good, a grant at the rate

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* The "two hours" may include half an hour weekly for the special drawing required under par. 3 (*d*); and must include at least one hour and a half weekly of actual use of the tools by the boys themselves working at the bench.

† This condition will be held to be satisfied if the Time-table of the School shows that for every Scholar in the School 20 hours in each week, irrespective of the time assigned to manual instruction for which a grant is claimed from the Department of Science and Art, are given to the other subjects prescribed by the Codes of the English and Scotch Education Departments.

of 2*d.* a lesson,* with the addition of 20 per cent. if the instruction is excellent, will be made for every Scholar instructed, provided that the Managers certify—

(*a*) that he has been placed in the 5th or a higher Standard of the Education Code;

(*b*) that he has received manual instruction for at least two hours a week for not less than 15 weeks during the *period for which the grant is claimed*, and while he was a Scholar of the Elementary Day School attending that School with reasonable regularity; and

(*c*) that a special register of attendance is kept and supervised by the Managers of the School, or by the Committee of the Manual Class when the instruction is given at a central School or Workshop under the management of a separate Committee.

7. The grant may be reduced or wholly withheld at the discretion of the Department for any breach of the rules, or for any error or neglect on the part of the Managers or Teachers, or if it appears that the plant is insufficient or that the instruction is not good; and no grant will be made unless the instruction has been given continuously, for two hours weekly throughout the period ending with the date of the examination; or for at least 22 weeks continuously, for the year in which manual instruction is commenced.

8. The grants to all Schools examined in the year ending 31st August, 1896, will be paid for the period between the end of the previous School Year of each School and the date of the examination; except that in cases of a first examination the grant will be paid for the period between the date of commencing the instruction and the date of the examination, such period being at least 22 consecutive weeks. *The grant may be claimed for lessons given between the date of the examination and the end of the School year to boys who have received the required instruction (par. 6 (b) above) for at least 15 weeks, and who leave the School at, or shortly after, the end of the School year. The grant for such lessons must be claimed on the Form of Claim (No. 861) for the period ending with the date of the next examination.*

After the 31st August, 1896, the grants will be paid for the period between the examination of one year and that of the preceding year; excepting as provided for above in the case of a first examination.

9. The Managers of the School must inform the Department of Science and Art as soon as manual instruction is commenced in connexion with their school. (Apply for Form No. 620.) Application in Form No. 620.

10. In an organised Science Day School the grant for manual instruction can only be *claimed* on account of a Student who has *earned the variable grant.* Aid to organised Science Day Schools.

* The term "lesson" here means instruction of at least two hours' duration, whether given at one time or on separate days.

PART III.

AID TO TRAINING COLLEGES FOR TEACHERS.

Examinations.

Examinations.

1. *Students of Training Colleges will be examined at the May Examinations,* 1896, *at their Training Colleges in the following subjects of Drawing:—*

a. Freehand drawing of Ornament (Elementary Stage);
b. Model Drawing (Elementary Stage);
and
c. Drawing in Light and Shade from a cast (Elementary Stage).

2. *Application for papers must be made in Form No.* 119 *in accordance with § XXVII. (see page* 11*) and the examinations will be conducted by an officer of the Department.*

3. *Examinations in Model Drawing with chalk upon the blackboard will be held by the Department's Inspectors at dates which will be fixed by the Inspectors upon receipt of application for such examinations.*

Application for the examination in Blackboard Drawing of Students of Training Colleges must be made by 31*st March, on Form No.* 276.

4. The marks obtained at these examinations count towards the Certificate granted by the English and Scotch Education Departments.

The Elementary Drawing Certificate.

5. The Elementary Drawing Certificate (First Class) will be granted to Candidates who obtain a First class in the Elementary Stage of—

(*a.*) Freehand Drawing (Subject 2*b*);
(*b.*) Model Drawing (Subject 3*a*);
(*c.*) Shading from Casts (Subject 5*b*); and
(*d.*) A Pass in the Elementary Stage of Practical Plane and Solid Geometry (Science Subject I.).

Payments on Results.

6. The payments claimable (in Form No. 678) by the Authorities of Training Colleges on account of each student are 15*s.* and 7*s.* 6*d.* for a first class or second class respectively in each of the four subjects named in paragraphs 1 and 3, on page 102. Payments.

No payment is made on account of a student who has been previously successful in a higher Stage of the same subject, or of a corresponding subject in former schemes of examination. If the student has been previously successful in the same Stage of the same subject, or in a corresponding subject, the payment on his account will be reduced by the payment which would be claimable on such previous success; but when such previous success has been obtained in the same College and has not been paid upon, the Department may allow the full claim. Previous success.

7. These payments are contingent on the employment of a teacher holding the Certificate D., the Elementary Drawing Certificate (First Class), or any higher Art Certificate.

Training Colleges in Ireland.

8. Students of Training Colleges in Ireland may be examined and earn payments on results in each of the four Subjects named in pars. 1 and 3 on page 102, provided that the Authorities of each College examined employ a Teacher holding the Elementary School Teacher's Drawing Certificate (D.), the Elementary Drawing Certificate (First Class) or any higher Art Certificate. Training Colleges in Ireland.

The College Authorities must supervise the instruction, and make the necessary arrangements for the examinations, in Subjects (a), (b), and (c) under the rules for the May examinations; and application for papers in these subjects must be made, by the Principal of the College, who will act as Secretary, in Form No. 119 in accordance with § XXVII. (see page 11). Application for the examination in Blackboard Drawing must be made by 31st March on Form No. 276.

The examinations will be conducted by an Officer of the Department.

Payments on results and the conditions attaching to them are the same as those stated in par. 6 above, and the payments must be claimed in Form No. 678. Payments.

APPENDIX A.

FORMS AND INSTRUCTIONS FOR GUIDANCE IN ESTABLISHING AND MAINTAINING SCHOOLS AND CLASSES.

Forms Common to Science and Art.

Form 170.
S. & A.

MEMORANDA FOR THE USE OF SECRETARIES AND MEMBERS OF SCIENCE AND ART COMMITTEES.

NOTE.—Secretaries of Science and Art Schools and Classes are particularly requested always to quote the "School Number" on all forms sent to the Department, and on all correspondence.

Copies of any of the forms mentioned in the Science and Art Directory which are required by Secretaries may be obtained on application to the Department. An endeavour is made to forestall, as far as possible, the requirements of Secretaries, but the Department undertakes no responsibility for the transmission of forms unless a special application for them has been received.

General Duties.

Visiting School.	To visit the School frequently, see that the regulations of the Department are duly carried out, and that the entries in the Registers are correctly made in Ink, from day to day. (*See* Form No. 1069, p. 113.)
Inspecting Registers.	The Secretary, or other member of the Committee who visits the Class, is requested to record, in the space provided in the Attendance Register, the number of students of that Class present at the time of his visit, and to certify the same with his dated signature. (*See* Form No. 1069, p. 113.)
Meeting Inspector.	To summon a meeting of the Committee, when requested, on the occasion of the visit of the Inspector. (*See* § XL.).
Custody of Apparatus, &c.	The Committee are responsible for the safe custody, on the premises, of all the apparatus, examples, casts, &c. purchased with aid from, or lent by, the Department; the Committee should meet and inspect such objects at least once a year, and the Secretary should fill up annually the certificate on Form No. 120, stating their condition.

CALENDAR OF SPECIFIC DUTIES, WITH DATES FOR SPECIAL RETURNS DURING THE SESSION.

The Department recognises as a session the 12 months from one May examination to the succeeding May examination.

ON OPENING OR RE-ASSEMBLING OF SCHOOL.

Form No. 120, informing the Department of the formation of a new School or Class, to be carefully filled in and sent prior to its opening. (*See* Form No. 990.)

If the School have a class in Practical Chemistry, or in Practical Metallurgy, the space provided on the second page of Form No. 120 should be filled up. (*See* Science sec. 18, p. 31.)

As soon as Form No. 120 is received the necessary registers will be sent to the Secretary. (*See* Form No. 1069, p. 113.)

An old School or Class should send Form No. 120 before re-commencing work after the examination. Whether from an old or from a new School, unless Form No. 120 is received before the 1st October the Department may refuse to make payments on the results of the next examinations. The acceptance of Form No. 120 after the 30th September will be exceptional, will be subject to a deduction from the grant, and Schools from which Form No. 120 has not been received before the 1st October will not be included in the Calendar of the Department.

ATTENDANCE REGISTERS.

Attendances at instruction in any subject of Science or in any Art Group after the Examination in such Subject or Group are to be recorded in a new copy of the attendance register.

Form No. 88, forming the Committee, or, if it be an old School, Form No. 168, continuing the Committee, to be sent in as soon as possible after the May examinations. Unless the one or the other form be received by the 31st October (except the Committee has been duly recognised as permanent—*See* § IX. sec. 1 and § X. sec. *c*) the Department may refuse to make payments on the results of the next examination, and if these are exceptionally allowed they will be reduced. Any alterations which the Department may indicate as necessary must be made by the 31st January, so that the Committee may receive at least the Department's provisional approval by that time, or the School or Class will not be allowed to participate in the ensuing examinations. (*See* § X.)

REPORTING CHANGES.

Although the arrangements for the current session returned on Form No. 120 (*see below*) are not necessarily final, they must be adhered to until a letter intimating the intended alterations has been sent to the Department, and its receipt acknowledged. The Secretary should, therefore, report any changes in the Teaching Staff; in the subjects of instruction; in the days and hours of meeting of the Classes; in the constitution of the Committee; in the address of the Secretary or Teacher; and any other particulars of importance.

The necessity of strict attention to this requirement is obvious, as those lessons only which are given on days and between hours previously reported to the Department, and which are given by teachers of whose appointment it has approved, and in buildings which it has recognised, can be registered or counted towards the number necessary to secure payments on the results of the examinations.

REDUCED GRANT.

When owing to an omission to report changes in the time-table as returned on Form No. 120, an Inspector fails to see a class under instruction, the cost or a part of the cost of his visit will be deducted from the next grant paid to the Committee.

BEFORE 1ST AUGUST. Submit names of successful competitors for Science and Art Scholarships on Form No. 281.

Where an organised Science School has been formed in accordance with provisions of Science Sections 22–28, submit time-table on Form No. 122.

N.B.—The School year of an organised Science School is held to terminate on the 31st July.

BEFORE 1ST SEPTEMBER. Report where Local Exhibitioners will pursue their studies.

Furnish certificate on Form No. 1066 that Science and Art scholars are progressing satisfactorily.

BEFORE 1ST OCTOBER. If a loan of one of the collections of Scientific Apparatus prepared for circulation to Science Schools is desired, send in Form No. 802. (*See* § XLIX. and p. 123.)

IRISH SCHOOLS - See Special Rules for Science Schools in Ireland, Directory, p. 59.

BEFORE 16TH JANUARY. Send in Form No. 1175*b*, application for a local examination in Elementary Modelling.

BEFORE 10TH FEBRUARY. Local Committees desirous to appoint a Special Local Secretary for conducting the Science and Art Examinations for the town or district in which they are situated, should apply to the Department.

BEFORE 24TH FEBRUARY. Committees to discuss the arrangements for the receipt, safe custody, and distribution of the examination papers for use in the district, and to nominate, on Form 1116A or Form 1116C, a custodian of examination questions for the approval of the Department. (*See* § XXX.)

BEFORE 16TH MARCH. In places where a Special Local Secretary has been appointed, or an Amalgamated Examination Committee formed, Form No. 119 to be sent not later than 16th March to the Special Local Secretary or the Secretary of the Amalgamated Committee, as the case may be, for transmission to the Department before the 21st March. (*See* § XXVII.)

In places where neither a Special Local Secretary has been appointed, nor an Amalgamated Examination Committee formed, the Secretary of the Local Committee must before the 16th March send to the Department Form No. 119, giving the precise number of candidates for examination in each subject specified in that Form. (*See* § XXVII.) Applications for examination in Practical Chemistry and Practical Metallurgy must be made on Form No. 1010.

Note.—Care must be taken that application be made to the Department for all the papers of examination questions which are required in each subject on Form No. 119 or Form No. 1010. As the number of candidates allowed to sit in any subject must not exceed the number of papers applied for, additions to or alterations in Forms Nos. 119 or 1010, after their transmission to the Department, will only be permitted under very exceptional circumstances, and no addition or alteration can, under any circumstances, be made after the 21st of March. No Examination will be held in Schools from which Form No. 119 or 1010 has not been sent before the 16th or 21st March in accordance with the above paragraphs. Applications made after the proper date or such as have not been made strictly in accordance with the rules will not be entertained.

ON 1ST APRIL - To send to the Department the Science and Art works for examination for payments and certificates with Form No. 528. (*See* § XVIII., Science sec. 19, and Art sec. 28.)

In April	Before the examinations commence, the Secretary of the Local Committee of a School or Class which is to resume work immediately after the examinations are over should apply to the Department for Form No. 120. This form should be filled up with particulars of the instruction to be given after the examination, and, as far as possible, in other respects. When Form No. 120 is returned to the Department the Secretary will be supplied with the registers which the time-table on Form No. 120 shows to be necessary. The School or Class will thus be enabled to record attendances at instruction in any subject of Science or in any group of Art after the date of the examination in such subject of Science, or after the last examination in such group of Art, in a new copy of the attendance register as required by the regulations.
Before 5th April	Application for Science and Art Scholarships to be made on Form No. 280, for Local Exhibitions on Form No. 286.
Before 15th April.	To request candidates for Whitworth Scholarships and Exhibitions to send in Form No. 330; candidates for Royal Exhibitions, National Scholarships, or Free Studentships in Science to send in Form No. 330a (*see* Science, secs. 50 and 51); and candidates for Local Scholarships and Royal Exhibitions in Art to send in Form No. 1181 (*see* Art, sec. 46).
On the 19th April.	To see that Science Form No. 91 (for Schools in Ireland, No. 91B) or Art Form No. 965c is hung up in the schoolroom. Warn all candidates for examination to be present at least 10 minutes prior to time fixed for its commencement. In Ireland examinations commence half an hour, by Dublin time, earlier than the times stated on the Time Tables, pp. 27, 28.
On the 25th April (for Science).	If a parcel containing (1) the papers for the candidates to work upon, (2) copies of Form No. 91 (or Form No. 91B for Schools in Ireland), one for each subject of examination, and (3) canvas bags in which to return the worked papers, should not have been received, or if there should be any mistake in the number sent for each subject as applied for, or in the covering letter, to communicate AT ONCE with the Department.
During the May Examinations.	The examination questions for Science and Art subjects for each evening will be sent to the duly appointed local custodian in registered letter packets, so as to arrive on the morning of the day of examination, or possibly the evening before. The local custodian must arrange for the receipt of the packets, and for their safe custody, until the examination commences. (*See* § XXIX.)
On the Evening of Examination.	To have in the Examination Room on each night of examination the General Register of the School (Form No. 486), posted up with an accurate list of the members of the Committee approved by the Department for the current session. (*See* Form No. 1069, p. 113.) To adhere rigidly to the letter of the rules on Forms No. 91, 91B, 91D, 91E, 91F, 91M, or 965c. To sign a Form No. 91, 91B, 91D, 91E, 91M or 965c, for each subject of the Science or Art Examinations. To fasten

up the papers in one of the canvas bags provided, the specimens and paintings in the other packings provided, and at once post them.

BEFORE 10TH JUNE — To request candidates competing for Royal Exhibitions National Scholarships, Free Studentships in Science or Whitworth Scholarships and Exhibitions to return Form No. 400 (*see* Science, secs. 50 and 51), and candidates competing for Local Scholarships and Royal Exhibitions in Art to return Form No. 1202 (*see* Art, sec. 46).

AFTER THE ANNOUNCEMENT OF THE RESULTS OF THE EXAMINATIONS. — On receiving the lists of the results, to communicate the contents to the Teacher and to each candidate whose name appears in them, and to distribute to the successful candidates the cards or certificates recording their success. These will be sent as soon after the examination as they can be prepared, but the Department cannot guarantee their delivery by any specified date.

In cases where prizes are claimable to return, as soon as possible, Science Form No. 161, and Art Form No. 571*d*, filled up in strict accordance with the rules under which prizes are granted. Applications for prizes will be forwarded to the Department's agents for execution in the order in which they are received, but the Department cannot guarantee the delivery of prizes by any specified date. To call a meeting of the Committee to examine and certify the claims for payment (Science Form No. 51 or 51A, and Art Form No. 526,) and the General and Attendance Registers, which must be sent, together with the claims for payments and prizes, to the Department as vouchers in their support.

Apply for payment of grant for Science and Art Scholars on Form No. 282, and apply for renewal of Scholarships on Form No. 473.

It is requested that all claims for payments or prizes be made as soon as possible after the results of the examinations at which they are earned have been communicated to the School.

To keep a record of, and inform the Department of the number of individuals examined.

Note.—A deduction of half-a-crown is made from the next payment to the School for every day's delay in sending in a Form, Return, or Works.

Official communications should be written upon good foolscap paper and sent in envelopes addressed to the Secretary, Department of Science and Art, London, S.W. The postage need not be prepaid, and it is particularly requested that Post Cards and Correspondence Cards may not be used.

The telegraphic address of the Department of Science and Art is "Science Art, London."

To each of the Forms Nos. 51, 51A, 88, 88B, 88C, 120, 120A, 122, 168, 1104, and 1160 is attached a slip. If this slip is filled up by the person transmitting the form it will be detached, stamped with the dated official stamp, and returned to the sender as an acknowledgment that the form in question has reached the Department.

Form 88.
S. & A.

This form should be sent in as soon as a committee is formed. Unless it is received by the 31st October, the Department may refuse to make payments on the results of the next Examinations. The acceptance of the form after that date will be exceptional, and will be subject to a deduction from the grant.

*School Number _____

RULES FOR FORMATION AND CONTINUANCE OF LOCAL COMMITTEES FOR SCHOOLS AND CLASSES RECEIVING AID THROUGH THE DEPARTMENT OF SCIENCE AND ART.

1. Every Science or Art School or Art Class in connection with the Department of Science and Art must be under the superintendence of a Committee. A Local Committee may, with the sanction of the Department, supervise classes meeting in different places, but the Department will not recognise more than one Committee for the supervision of instruction given in any one building.

Committee to consist of at least five members.

This Committee must consist of a Chairman, a Secretary, and at least three other members. The offices of Chairman and Secretary cannot be held by the same person. All the members of the Committee must be well-known responsible persons of independent position, who have no personal interest in the Teachers of the School.

The following are not eligible to be members of the Committee:—Candidates for examination by the Department or their Teachers in ANY subjects; relatives of teachers under the Department; teachers of schools which have candidates for examination, and teachers of schools receiving Government grants. A member of Committee must not take any part in an examination at which a relative of his is a candidate.

Chairman and at least one other member must be of position defined.

2. It is very desirable that as many persons as possible in recognised positions of public responsibility in the district, such as Mayors, Provosts, Town and County Councillors, Magistrates, Members of School Boards, Trustees of Grammar Schools, Clergymen of the Established Church in parochial employment, and Ministers of Religion in charge of legally recognised places of public worship, should be on the Committee. It is ABSOLUTELY NECESSARY that at least two such responsible persons should agree to act. The Chairman, who will be required to certify that the constitution of the Committee is in accordance with the above requirements, must be in a position of public responsibility as defined above.

Intending members to be acquainted with their duties and sign this form

3. The persons† who intend to act on a newly constituted Local Committee must sign and complete this form. No one can be a member of the Committee, or assist in the conduct of an examination, whose membership has not been PREVIOUSLY approved by the Department. Care must be taken that the members are properly acquainted with their duties; a summary of which is given below (see § 5). The details of these duties are fully stated in the

* The space here may be left blank, but when the Committee is approved, a number will be assigned to the school, and this number should appear upon *all* communications subsequently addressed to the Department.

† Ladies may act on a Local Committee. On signing this form they should state whether they are spinsters, married women, or widows. Where they have themselves no occupation, spinsters should give the past or present occupation of their fathers, and married women and widows that of their husbands.

Science and Art Directory, which may be obtained on application to the Secretary of the Department.

Mode of formation of Committee.

4. When a school or class is first formed, the following undertaking must be signed AT A GENERAL MEETING OF THE COMMITTEE.

SUMMARY OF DUTIES.

5. The Department requires that the Local Committee shall—

Custody of apparatus and examples.

a. Provide and maintain a room or rooms for the class instruction, with firing and lighting, together with such apparatus and examples as are required to illustrate the instruction. Be responsible for the safe custody on the school premises of all apparatus and examples towards the purchase of which the Department has granted aid, or which it has lent.

Arrangements for examination.

b. Provide a room or rooms of sufficient size to carry out the annual examination according to the detailed regulations prescribed in the Science and Art Directory. To this examination ALL persons who wish to present themselves, and not only those attending the school or class, must be admitted, provided that they have given due notice according to the rules. Persons who do not belong to the school or class may be required to pay the authorised fee for each subject in which they register their names for examination.

Visiting classes, inspecting and signing Registers.

c. Frequently visit the school during the attendance of the Science and Art classes; sign the attendance register and enter in it the number of students present, and take care that the school registers (Science and Art Forms Nos. 486, 486A, and 486B), showing the occupations of the students, their attendances, payments of fees, &c., are kept from day to day, in accordance with the regulations in Form No. 1069, and sent to the Department of Science and Art, together with the claim for payment on the results of the examinations.

Holding examinations.

d. Send to the Secretary of the Department, to the Special Local Secretary, or to the Secretary of the Amalgamated Committee (in Form No. 119 or Form No. 1010), a list of the students to be examined, specifying the subjects in which they are to be examined. Superintend, if required, the examinations in accordance with the rules of the Department; give out the examination papers which will be sent for that purpose; see them fairly worked and certify the same, the number of members of the Committee required by the regulations to act as superintendents being ALWAYS present; and send the worked papers, under seal, by the day's post to the Secretary of the Department. (When a Special Local Secretary is appointed by the Department, the Committee is relieved of a part of this work. * See Science and Art Directory, § XXII.)

Forwarding works and annual report.

e. When required, transmit to the Department for examination works executed in the school or class during the previous year, and make an annual report of its proceedings.

Certifying claims.

f. Certify that the students, on the result of whose examination claims for payment are made, belong to the industrial classes as defined by the Science and Art Directory, § XXXII., and that the payments claimed are due according to the regulations.

Certifying Number of Lessons.

g. Certify that during the session the required number of lessons have been given in each subject by a duly qualified teacher, and that all students, on account of whose instruction payments or prizes are claimed, have received at least 20 such lessons since the last examination at which they were successful, each lesson being an attendance at a meeting of the class of at least an hour's duration on a separate

* Local committees desirous to appoint a special local secretary for conducting the Science and Art examinations in the town or district in which they are situated should apply to the Department before the 10th February.

day. That 20 lessons have been given since the last examination in the subject at which the candidate was successful; within two years immediately preceding the examination on account of which the claim is made, and under the supervision of this Committee.

4. Undertake that the School, with all its apparatus and examples, shall be at all times open to the visit and inspection of the Officers of the Department. School open to Department.

6. The school or class will be inspected periodically by an officer of the Department, who will report whether the regulations are strictly carried out. A meeting of the Committee must be held to receive the Inspector if he should so require in giving notice of his visit; at such meeting as many of the members as possible are expected to attend. Committee to meet Inspector.

FORM of APPLICATION to act as a COMMITTEE for a SCIENCE or ART SCHOOL or ART CLASS receiving AID through the DEPARTMENT of SCIENCE and ART.

Directions.

This form is to be filled in, signed at a general meeting of the Committee, certified by the Chairman, and returned to the Department IMMEDIATELY on the formation of a local committee. To be sent on the formation of school or class.

This form must be sent in by the 31st October, and any alterations considered necessary by the Department be made before the 31st January. Latest dates for return and alterations to secure grants.

Should this Committee continue to act for next session, Form No. 168 should be filled in with the names of all the old members who consent to continue to act on the Committee, as well as those of any new members added to the old Committee, and be transmitted to the Department. Continuance of committee.

When it is desired to add new members to the Committee during the progress of any session such new members should sign the undertaking on Form No. 885, which, after having been duly certified by the Chairman of the Committee, should be returned to the Department.

Undertaking.

We, the undersigned, declare that we have read the rules for formation and continuance of Local Committees, the summary of duties, the directions and the undertaking given herein, and that in accordance with them we propose to act as the Local Committee for the

_____ [Science School, School of Art, or Art Class.] *

held at the _____ [Name of Institution or Building.] †

_____ [Name of Street or Place.] †

_____ [Name of City, Town, or Village, if not a Post-town state Post-town.] †

_____ [Name of County.]

and taught by _____

_____

_____ [Give the names of all the teachers.]

* State which in the blank space.
† Strike out the words printed in brackets which do not apply.

N.B. If this Committee acts for more than one School the names of the different buildings in which they are held must be distinctly stated above.

And we undertake till the 31st August 189 , or until another Committee satisfactory to the Department of Science and Art has been appointed, the several duties and responsibilities herein detailed.

SIGNATURE.	ADDRESS.	OCCUPATION.	N.B.—Members holding positions of public responsibility as defined in paragraph 2 of this form, should give particulars in this column.
Chairman.			
Secretary.			Secretary's occupation.

Secretary's name, style, and address in full, as envelopes should be addressed.

I certify that all the above are autograph signatures affixed in my presence at a general meeting, and that this Committee complies with the requirements of the Rules 1 and 2.

Chairman.

Form 1069.
S. & A.

INSTRUCTIONS FOR KEEPING REGISTERS.

N.B.—Unless these instructions are strictly observed the grant may be reduced or withheld.

All Registers must be kept on the School premises, and be always available for inspection by the Committee or by the Inspector of the Department.

THE GENERAL REGISTER.

REGULATIONS FOR SCIENCE AND ART.

1. In this Register, Form No. 486, the name, autograph signature, age, address, occupation, and previous success (if any) of students must be entered, in ink, immediately on their joining the Science or Art School or Class. The list of the Local Committee should also be entered and kept up to date.

2. This Register must be sent from all Schools of Art and Branches of Schools of Art; and from all Science Schools and Art Classes which have not been inspected during the session, *at a time other than when an examination is held*, with the claim for payments on results, to the Secretary of the Department, who will return it to the Secretary of the Local Committee, after examination, provided Form No. 120, for another session, has been sent to the Department.

3. When this Register is returned to the school, successes which students may have obtained subsequently to the entry of their names, must be duly posted up against that entry. A student will thus retain the same identifying number in this Register during all the sessions in which he may belong to the classes.

4. The Register is to be kept on from year to year, and a fresh copy should only be applied for when there is insufficient space in the old Register for the requirements of the current session. A new General Register must be commenced with the number next to that with which the old General Register concluded. The old and new General Registers will both continue in use, the new students' names, &c. entered in the new General Register, and the record of the old students continued in the old General Register.

5. The General Register must be kept on the school premises, and be always available when the inspector or members of the Committee visit the classes and the examinations.

THE ATTENDANCE REGISTER.

REGULATIONS FOR SCIENCE AND ART.

6. The student's number in the General Register must be repeated against his name in the Attendance Register; the numbers in the General Register are required to be *consecutive*, and the numbers in the Attendance Register will *not* necessarily be consecutive.

7. The attendance of students must be registered, and the record of their attendance or absence must be entered next to the last lesson recorded. No blank columns may be left. In cases where there is insufficient space in the Attendance Register to record attendance at all the lessons which are to be given during the session, the Department will, on application, supply interleaves for the Attendance Register.

8. Members of the Committee who visit the classes should record on the front of the Attendance Register the number of students present, attesting

the same by their dated signatures; they should also see that the Registers are properly kept.

9. The Attendance Register may be used for one session only, and is retained by the Department; it must accompany the General Register when the claim is sent to the Department. When Form No. 120 is received a fresh Attendance Register will be issued, and as the arrangements for the session on Form No. 120 are not necessarily final, they can be varied with the sanction of the Department.

10. The Secretary of the Local Committee, when forwarding the Attendance Register to the Department, is requested to retain a memorandum of such information as he will require in order to fill up the Annual Report, Form No. 168.

Regulations for Science only.

11. A separate copy of Form No. 486*a* must be used for each subject of Science taught, and for each Division *a* and *b* of Subject VI., and *a*, *b*, and *c* of Subject VIII.

Practical Inorganic Chemistry (Science Subject X. *p*), Practical Organic Chemistry (Science Subject XI. *p*), and Practical Metallurgy (Science Subject XIX. *p*), are each treated as a separate subject. Attendance at instruction in these subjects must not be recorded in registers used for Inorganic Chemistry (Science Subject X.), Organic Chemistry (Science Subject XI.), and Metallurgy (Science Subject XIX.).

Lessons may not be registered in more than two subjects of Science for a student on any one day, except on Saturdays, when lessons in three subjects may be registered.

No student may be recorded more than once upon any one day as present at instruction in any one Science Subject.

12. The presence or absence of each student must be entered IN INK during the actual meeting of the class; his presence is to be indicated by the letter "p" and his absence by a firm horizontal line thus ——; and no student may be recorded as present, unless his attendance at the lesson in question extends over a full hour and a half in Practical Chemistry or Practical Metallurgy, or over a full hour in any other subject. The total number of students present at each meeting of the class must be entered at the foot of that column in which their attendance for the day is recorded, and such entry is to be made when the register is marked, and to be verified by the teacher's initials; SUBSEQUENT ALTERATIONS AND POSTING UP OF ATTENDANCES, OR OF TOTALS, IS PROHIBITED. Should a mistake in registration occur the fact must be reported, before the next lesson, to the Secretary of the Committee, who will note the circumstances upon the register with his dated signature affixed.

Regulations for Art only.

13. All the attendances of a student who is receiving instruction in Art must be recorded in a single copy of this Register. *Form No. 486b, excepting as regards Geometrical Drawing (Art) for which subject a separate register Form No. 486c must be kept and marked in accordance with par. 12 above.* When necessary, interleaves will be supplied on application.

14. Lessons must not be registered in more than two of the following groups of subjects for a student on any one day except on Saturdays, when lessons in three groups of subjects may be registered, and no student may be recorded more than once on any one day as present at instruction in any one group. For registration purposes the subjects are grouped as follows:—

Group A. Drawing.	Group B. Architecture.	Group C. Theory and Designing.
Freehand drawing of ornament (subjects 2*b* and 3*b*).	Architecture (subject 1*d*).	Principles of ornament (subject 22).
Model drawing (subjects 3*a* and 5*a*).	Architectural design (subject 23*b*).	Historic ornament (subject 22*d*).
Drawing in light and shade from a cast (subject 5*b*).	*Perspective (subjects 1*c* and 1*e*).	Design (ornament). (Elementary and Advanced stages, subject 23*c*).
	Mechanical drawing (subjects 1*b* and 23*a*).	

* NOTE.—Attendances in Science Subject I. qualify for payments on results of examinations in Perspective.

Group D. Painting.	Group E. Study of the Figure.	Group F. Modelling.
Painting ornament in monochrome (subject 11*a*). Painting from still life (subject 15).	Anatomy (subject 9). Drawing and painting from the life (subjects 8*c* and 17). Drawing and painting from the antique (subjects 8 and 16). Design (Honours), (subject 23*d*).	Modelling from a Cast (subject 18*a*). Modelling design ornament (subjects 23*e* and 23*f*). Modelling from the life (subject 19*h*). Modelling from the antique (subject 19*b*[1]).

15. The presence of a student must not be entered until he has given at least a full hour's attendance, and then the entry must be made IN INK during the actual meeting of the Class. The absence of a student must be entered at the last meeting of the class on that day, when the total number of students present during the day is to be made up and initialled by the teacher giving the instruction; SUBSEQUENT ALTERATIONS AND POSTING UP OF ATTENDANCES, OR OF TOTALS, IS PROHIBITED. Should a mistake in registration occur the fact must be reported, before the next lesson, to the Secretary of the Committee, who will note the circumstances upon the register with his dated signature affixed.

16. In the Art Attendance Register (Form No. 486*b*) the presence of a student must be recorded by the Roman capital of the group A, B, C, D, E, or F, in the subjects of which he is on that occasion receiving instruction; his absence must be recorded by a firm horizontal line, thus ——. When a student is under instruction in three groups on Saturday, or in two groups on other days, the letters of those groups will be placed against his name in the dated column for the day, *e.g.*, $\frac{\text{A}}{\text{D}}{\text{F}}$ or $\frac{\text{C}}{\text{E}}$.

Form 555.
S. & A.

BUILDING GRANTS FOR SCHOOLS OF SCIENCE OR ART.

Department of Science and Art,
London, S.W.

SIR, 18

I AM directed to inform you that in order to obtain a Grant in aid of buildings for Science or Art Schools, application must be made on the enclosed form (Form No. 348).

I am also to request your attention to the general rules on the following pages which have been laid down to guide applicants for a Grant in the laying out and construction of the buildings, preparation of the trust deed, &c.

I am, &c.

REGULATIONS UNDER WHICH BUILDING GRANTS ARE MADE TO SCHOOLS OF SCIENCE OR ART.

A.—PRELIMINARY.

1. Grants are made to aid in—
   a. Erecting suitable buildings for Schools of Science or Art.
   b. Erecting suitable rooms as parts of, or as additions to, buildings to be used for other purposes.
   c. Acquiring and adapting building already erected.

The buildings (or portions of them) in respect of which a grant is made must be secured to the purposes of a School of Science or of Art as laid down in Section 17, *infra*.

2. Application for the grant must be made by the Committee of the School, or if it be established under the Public Libraries Act, or the Technical Instruction Act, 1889, by the Local Authority administering the Act.

3. *Applications for grants may be made at any time of the year. Payment cannot be definitely promised at any particular date, but grants will be paid in the order in which the complete claims (see § 21 infra) are received.*

4. A grant is made to a School of Science only if it is built—
   a. Under the Public Libraries Act; or
   b. In connexion with a School of Art aided by a Building Grant from the Department of Science and Art; or
   c. Where the Local Authority levies a rate in accordance with the provisions of the Technical Instruction Act, 1889; or
   d. Where a School Board Rate is levied under the provisions of the Technical Schools (Scotland) Act, 1887.

5. A grant will not exceed 2*s.* 6*d.* per square foot of internal area, or one half the amount provided either by voluntary contributions, or by local rate raised under the Technical Instruction Act or the Public Libraries Acts, or by both; and no grant will exceed 500*l.* on a School of Science, and 500*l.* on a School of Art.

6. No grant will be made unless the Department is satisfied—
   a. That there is a population in the neighbourhood which requires a School of Science or Art.
   b. That the School is likely to be maintained in efficiency.

7. The site, plans, estimates, specifications, title and trust deed must be satisfactory to the Department of Science and Art.

B.—THE SITE.

8. A plan of the site must be forwarded, showing the boundaries, approaches, and abuttals, and the directions of the points of the compass.

9. The site must be—
   a. In situation, not unhealthy, nor noisy; and within convenient distance of the homes of the students.

b. In tenure, fee-simple, without incumbrance, or reservation of rights over the surface, or of minerals.*

C.—The Plans.

10. Plans, sections, and elevations on a scale of 8 feet to an inch, accompanied by the specifications and an estimate of the cost of the building, must be submitted for approval with the application.

11. The size and number of rooms will depend on local circumstances, and the different subjects to be taught in the School.

12. The following general regulations should be adhered to:—

(*a.*) The rooms for study should be not less than 15 feet high to the wall plate, if ceiled flat, or 12 feet high to the wall plate if ceiled to the collar-beams or the common rafter.

(*b.*) The windows should be large, and in Art Schools, free from mullions or small panes.

(*c.*) The class-rooms should, as far as possible, communicate with each other directly as well as by passages. When there are more storeys than one, the staircase should give access to all rooms without passing through rooms; also to cloak-rooms, lavatories, &c. The arrangements for lighting with gas, for warming, drainage, &c. should be complete. The rooms should be well ventilated by the admission of air below the gas lights, and by the extraction of vitiated air by means of shafts carried up above the roof.

(*d.*) Waterclosets, urinals, and a lavatory must be provided; the accommodation for female students must be separate.

(*e.*) The external walls of the school, if of brick, should not be less than one brick and a half in thickness; and if of stone, not less than 20 inches in thickness. All the roofs must be either tiled or slated. Gutters and drains to carry away the roof-water must be provided.

(*f.*) If the roof be unceiled to the tie-beam or collar-beam, there must be ceiling to the rafters. Rooms which are top-lighted should in all cases be ceiled to the common rafters in order to give increased height; and all tie-beams or other heavy roof-timbering should be avoided, and iron tie-rods used where practicable.

13. No grant will be given for a School of Science unless there be a room properly constructed and fitted up for lectures on experimental science, and at least one room properly arranged as a laboratory for practical work in one or more subjects of Science.

14. For a School of Art the following dimensions are considered to afford adequate provision for 50 students. Proportionately increased accommodation must be provided for greater numbers.

a. One Elementary room 20 × 30 feet. This room should be not less than 16 feet high, and may be lighted by skylights as well as by side windows.

b. One room for study from Life or Life-size casts, not less than 20 × 24 feet. This room should be lighted from the north side by a single large window, the top of which (carried up in a dormer if necessary) should be at a height above the floor equal to ¾ the depth of the room, or if the pitch of the roof be steeper than 60°, a skylight should be made in continuation of the windows, so as to gain the same effect in lighting.

c. One modelling room 20 × 15 feet.

d. One master's room 12 × 15 feet. This room should be lighted by a side light from the north, if possible.

e. One cloak-room for females 12 × 8 feet 6 inches.

f. A kitchen and bedroom for the attendant, each 12 × 10 feet.

15. In the case of the purchase of buildings already erected, they must be certified by an officer of the Department to be suitable in all respects for the purposes of the School.

* A leasehold site is not admissible if the fee-simple can be obtained; and no lease with a shorter term than 99 years, or with more than a nominal rent, is admissible.

16. The plans (with specifications and estimates), when approved and sealed, may be returned to the promoters for use, but must be lodged in the Department of Science and Art before a grant is paid.

D.—The Trust Deed.

17. In the case of a school established under a committee the premises must be conveyed to Trustees under a deed, which must provide—

a. That the building be used in perpetuity* and solely, in the case of a School of Art, as "a School for the Instruction of Children and "Adults in Drawing, Painting, Modelling, Designing for Architecture, Manufactures, and Decoration," and in the case of a School of Science as "a School for the Instruction of Children and "Adults in the pure and natural Sciences applicable to Industry "and Manufactures."

b. That it shall be open at all times to the inspection of the officers of the Department of Science and Art.

c. That the students shall be instructed by teachers qualified to earn payments from the Department on the result of their teaching.

d. For the constitution and renewal of a body of responsible trustees, and of a committee of management.

18. In the case of a School established by a Local Authority that body must enter into a covenant embodying the above provisions *a*, *b*, *c*, of § 17.

19. The trust deed, or covenant, must not be executed until it has been approved in draft by the Department of Science and Art.

20. When a trust deed has been executed, and, if necessary, enrolled, it must be submitted to the Department of Science and Art, together with the approved draft, and a copy, including all signatures, attestations, and endorsements, made on plain unstamped paper. This copy will be retained, and the original deed and draft returned to the promoters. When a covenant has been executed it must be sent to the Department together with the approved drafts, which latter will be returned.

E.—Payment of Grants.

21. The grant is paid on presentation of a certificate (with balance-sheet annexed), by the Building Committee of the School, setting forth that the building and conveyance are duly completed, and that the money in hand will, when added to the grant, meet all claims, and finally close the account.

22. Grants are treated as lapsed if *the above certificate is not presented* at the end of 18 months, from the date of announcing them.

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* If any power of sale, or of appropriating the premises to other uses than those of a School of Science or Art, be reserved, the deed must contain a condition securing the repayment of the grant to the Lords of Her Majesty's Treasury

TECHNICAL INSTRUCTION ACT, 1889.

52 & 53 Vict., Chapter 76.

An Act to facilitate the Provision of Technical Instruction.

[30th August 1889.]

BE it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

Power for local authority to supply or aid the supply of technical instruction.

1.—(1.) A local authority may from time to time out of the local rate supply or aid the supply of technical or manual instruction, to such extent and on such terms as the authority think expedient, subject to the following restrictions, namely:—

(*a.*) The local authority shall not out of the local rate supply or aid the supply of technical or manual instruction to scholars receiving instruction at an elementary school in the obligatory or standard subjects prescribed by the minutes of the Education Department for the time being in force:

(*b.*) It shall not be required, as a condition of any scholar being admitted into or continuing in any school aided out of the local rate, and receiving technical or manual instruction under this Act that he shall attend at or abstain from attending any Sunday school or any place of religious worship, or that he shall attend any religious observance or any instruction in religious subjects in the school or elsewhere: Provided that in any school, the erection of which has been aided under this Act, it shall not be required, as a condition of any scholar being admitted into or continuing in such school, that he shall attend at or abstain from attending any Sunday school or any place of religious worship, or that he shall attend any religious observance or any instruction in religious subjects in the school or elsewhere;

(*c.*) No religious catechism or religious formulary, which is distinctive of any particular denomination, shall be taught at any school aided out of the local rate, to a scholar attending only for the purposes of technical or manual instruction under this Act, and the times for prayer or religious worship, or for any lesson or series of lessons on a religious subject, shall be conveniently arranged for the purpose of allowing the withdrawal of such scholar therefrom;

(*d.*) A local authority may, on the request of the school board for its district or any part of its district, or of any other managers of a school or institution within its district for the time being in receipt of aid from the Department of Science and Art, make, out of any local rate raised in pursuance of this Act, to such extent as may be reasonably sufficient, having regard to the requirements of the district, but subject to the conditions and restrictions contained in this section, provision in aid of the technical and manual instruction for the time being supplied in schools or institutions within its district, and shall distribute the provision so made in proportion to the nature and amount of efficient technical or manual instruction supplied by those schools or institutions respectively;

(*e.*) Where such other managers of a school or institution receive aid from a local authority in pursuance of this section, the local authority shall, for the purposes of this Act, be represented on the governing body of the school or institution in such proportion as will, as nearly as may be, correspond to the proportion which the aid given by the local authority bears to the contribution made from all sources other than the local rate and money provided by Parliament to the cost of the technical or manual instruction given in the school or institution aided;

(*f.*) If any question arises as to the sufficiency of the provision made under this section, or as to the qualification of any school or institution to participate in any such provision, or as to the amount to be allotted to each school or institution, or as to the extent to which, or mode in which, the local authority is to be represented on the governing body of any such school or institution, the question shall be determined by the Department of Science and Art: Provided that no such provision, out of any rate

raised in pursuance of this Act, shall be made in aid of technical or manual instruction in any school conducted for private profit; and

(*g.*) The amount of the rate to be raised in any one year by a local authority for the purposes of this Act shall not exceed the sum of one penny in the pound.

(2.) A local authority may for the purposes of this Act appoint a committee consisting either wholly or partly of members of the local authority, and may delegate to any such committee any powers exerciseable by the authority under this Act, except the power of raising a rate or borrowing money.

(3.) Nothing in this Act shall be construed so as to interfere with any existing powers of school boards with respect to the provision of technical and manual instruction.

Provision for entrance examination.

2. It shall be competent for any school board or local authority, should they think fit, to institute an entrance examination for persons desirous of attending technical schools or classes under their management or to which they contribute.

Parliamentary grants in aid of technical instruction.

3. The conditions on which parliamentary grants may be made in aid of technical or manual instruction shall be those contained in the minutes of the Department of Science and Art in force for the time being.

Provisions as to local authorities.

4.—(1.) For the purposes of this Act the expression "local authority" shall mean the council of any county or borough, and any urban sanitary authority within the meaning of the Public Health Acts.

(2.) The local rate for the purposes of this Act shall be—

(*a.*) In the case of a county council, the county fund;

(*b.*) In the case of a borough council, the borough fund or borough rate;

(*c.*) In the case of an urban sanitary authority not being a borough council, the district fund and general district rate, or other fund or rate applicable to the general purposes of the Public Health Acts;

(3.) A county council may charge any expenses incurred by them under this Act on any part of their county for the requirements of which such expenses have been incurred.

(4.) A local authority may borrow for the purposes of this Act—

51 & 52 Vict. c. 41. (*a.*) In the case of a county council, in manner provided by the Local Government Act, 1888:

(*b.*) In the case of a borough council, as if the purposes of this Act were purposes for which they are authorised by section one hundred and six

45 & 46 Vict. c. 50. of the Municipal Corporations Act, 1882, to borrow:

(*c.*) In the case of an urban sanitary authority not being a borough council, as if the purposes of this Act were purposes for which they are authorised to borrow under the Public Health Acts.

Audit of accounts of aided schools.

5. Where the managers of a school or institution receive aid from a local authority in pursuance of this Act, they shall render to the local authority such accounts relating to the application of the money granted in aid, and those accounts shall be verified and audited in such manner as the local authority may require, and the managers shall be personally liable to refund to the local authority any money granted under this Act, and not shown to be properly applied for the purposes for which it was granted.

Audit of accounts of urban sanitary authority.

6. The accounts of the receipts and expenditure of an urban sanitary authority under this Act shall be audited in like manner and with the like incidents and consequences, as the accounts of their receipts and expenditure under the Public Health Act, 1875.

7. In the application of this Act to Ireland—

Application of the Act to Ireland.

(1.) The expression "local authority" shall mean the urban or rural sanitary authority, as the case may be, within the meaning of the Public Health (Ireland) Act, 1878.

41 & 42 Vict. c. 52.

(2.) The local rate for the purposes of this Act shall be—

(*a.*) in the case of an urban sanitary authority, the rate or fund applicable to the expenses incurred or payable by such authority in the execution of the Public Health (Ireland) Act, 1878, under the provisions of the said Act;

(*b.*) in the case of a rural sanitary authority, the rate or rates out of which special expenses incurred in respect of any contributory place or places are payable under the provisions of the said Act.

(3.) A local authority may borrow for the purposes of this Act as if the purposes of this Act were purposes for which the sanitary authority are authorised to borrow under the Public Health (Ireland) Act, 1878.

(4.) Any reference to the Public Health Act, 1875, shall be construed as a reference to the Public Health (Ireland) Act, 1878.

Meaning of technical and manual instruction.

8. In this Act—

The expression "technical instruction" shall mean instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to specific industries or employments. It shall not include teaching the practice of any trade or industry or employment, but, save as aforesaid, shall include instruction in the branches of science and art with respect to which grants are for the time being made by the Department of Science and Art, and any other form of instruction (including modern languages and commercial and agricultural subjects), which may for the time being be sanctioned by that Department by a minute laid before Parliament and made on the representation of a local authority that such a form of instruction is required by the circumstances of its district.

The expression "manual instruction" shall mean instruction in the use of tools, processes of agriculture, and modelling in clay, wood, or other material.

Extent of Act.

9. This Act shall not extend to Scotland.

Short title.

10. This Act may be cited as the Technical Instruction Act, 1889.

TECHNICAL INSTRUCTION ACT, 1891.

54 & 55 Vict., Chapter 4.

An Act to amend the Law relating to Technical Instruction.

[26th March 1891.]

BE it enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:

Explanation of powers of local authority as to technical instruction. 52 & 53 Vict. c. 76.

1.—(1.) Subject to the conditions and restrictions contained in the Technical Instruction Act, 1889, a local authority may—

(*a.*) Make such provision in aid of the technical or manual instruction for the time being supplied in a school or institution outside its district as may, in the opinion of the authority, be necessary for the requirements of the district in cases where similar provision cannot be so advantageously made by aiding a school or institution within its district; and

(*b.*) Provide or assist in providing scholarships for or pay or assist in paying the fees of students ordinarily resident in the district of the local authority at schools or institutions within or outside that district.

(2.) In distributing the provision made in aid of technical or manual instruction, the local authority may consider all the circumstances of the case, and shall not be bound to distribute the provision so made exclusively in proportion to the nature and amount of efficient technical or manual instruction supplied by those schools or institutions respectively.

Application of balances. 53 & 54 Vict. c. 60.

2. Any moneys received by a county council under sub-section (1) (*b*) of section one of the Local Taxation (Customs and Excise) Act, 1890, and directed by resolution of the county council to be appropriated or to be set aside for the purposes of technical or manual instruction, shall, although not expended or specifically contributed or allotted in whole or in part before the end of the financial year, remain applicable for such purposes, and shall not be applied in manner provided by sub-section (2) and the following sub-sections of section twenty-three of the Local Government Act, 1888, until the county council shall have made an order for such application. 51 & 52 Vict. c. 41.

Where a council shall have referred to a committee the question of appropriating to purposes of technical or manual instruction any sum consisting of the whole or any part of such moneys, this section, unless and until the council otherwise direct, shall, until the committee shall have made their report and the council shall have arrived at a decision thereon or the appointment of the committee shall have been rescinded, apply to such sum as if the same had been directed by the council to be appropriated to such purposes.

Construction of 53 & 54 Vict. c. 60. s. 1.

3. The expression "technical education" in section one of the Local Taxation (Customs and Excise) Act, 1890, shall be deemed to include both technical and manual instruction within the meaning of the Technical Instruction Acts, 1889 and 1891.

Short title and construction.

4. This Act may be cited as the Technical Instruction Act, 1891, and shall be construed as one with the Technical Instruction Act, 1889, and this Act and the Technical Instruction Act, 1889, may be cited together as the Technical Instruction Acts, 1889 and 1891.

See also—
Local Taxation (Customs and Excise) Act, 1890, 53 & 54 Vict. ch. 60.
Technical and Industrial Institutions Act, 1892, 55 & 56 Vict. ch. 29.
Schools for Science and Art Act, 1891, 54 & 55 Vict. ch. 61.
Technical Schools (Scotland) Act, 1887, 50 & 51 Vict. ch. 64.
Technical Instruction Amendment (Scotland) Act, 1892, 55 & 56 Vict. ch. 63.
Public Libraries Act, 1892, 55 & 56 Vict. ch. 53.
Public Libraries Consolidation (Scotland) Act, 1887, 50 & 51 Vict. ch. 42.

APPENDIX B.

FORMS SPECIAL TO SCIENCE.

Form 802B.
S.

MEMORANDUM as to CIRCULATION of APPARATUS and OBJECTS for the INSTRUCTION OF SCIENCE CLASSES.

The Lords of the Committee of Council on Education, with a view to the more efficient instruction of Science schools, have caused suitable collections of apparatus to be formed specially adapted for the illustration of Science teaching. These collections are exhibited in the South Kensington Museum, and are illustrative of the following Science subjects:—

Machine Construction.
Building Construction.
Naval Architecture.
Theoretical Mechanics.
Sound, Light and Heat.
Magnetism and Electricity.
Chemistry.
Geology.
Human Physiology.
Botany.
Navigation.
Steam.
Physiography (Parts I. and II.).
Agriculture (Diagrams).

My Lords have also caused duplicate sets of the above apparatus to be formed, and will be prepared to entertain applications from Science schools for lending them for a short period. They are lent in order that teachers may have an opportunity of examining and trying the apparatus, and be enabled to make a selection for purchase of that apparatus which would be most useful for instruction.

The following are the conditions on which loans will be granted:—

1. Applications for the loan of Science apparatus to be made by the Local Committee through their Secretary, the Committee to be responsible for the security and safe return of the objects lent.

2. Applications for loan of Science Collections during any year must be made on or before the 1st October of each year (*see* Form No. 802), and the Committee must be prepared to furnish full information as to the nature of the buildings in which the apparatus will be deposited, and what provision will be made for its safe custody and protection.

3. No set of apparatus will be allowed to remain on loan in any Science school for a longer period than three weeks.

4. Teachers will be allowed to use the apparatus for the purpose of demonstrating before their classes; but they must not be used by the students, and any damage which the apparatus may sustain whilst in the possession of the class will have to be made good at the expense of the Committee.

5. The cost of carriage of the collection to and fro will be defrayed by the Department.

Upon the receipt of the apparatus from the Department the Secretary of the Local Committee must immediately report the condition in which it is received, and specially notify any damage or injury. The Committee will be held responsible for the apparatus being safely repacked and will be accountable for any damage which the collection may receive from the time of its receipt by them until its return to the Department.

Form 1284.
S.

APPARATUS, ETC. CONSIDERED BY THE DEPARTMENT TO BE INDISPENSABLE FOR THE EFFICIENT TEACHING OF THE FOLLOWING SUBJECTS OF SCIENCE.

Subject I.—Practical Plane and Solid Geometry.

Cone with three sections. Model showing the projections, traces, and intersections of lines. Wire or other model of a triangular prism. Wire or other model of a square prism. Wire or other model of a hexagonal prism. Wire or other model of a cube. Wire or other model of a square pyramid. Wire or other model of a cylinder. Wire or other model of a cone. Drawing board and T square. Blackboard.

Subject II.—Machine Construction and Drawing.

Set of diagrams of machine details, mounted.

Subject VI.—Theoretical Mechanics.

Division I.

Lever; pulleys, set of simple; compound pulleys; wheel and axle. (These can be obtained to mount on a blackboard with suspension rail and hooks.) Screw. Pendulum, simple, with three balls. Pendulum, compound. Spring balance. Working models of inclined plane and wedge.

Division II.

Balance, with accessories for determining the specific gravity of an insoluble solid, whether heavier or lighter than water, and for determining the specific gravity of a liquid by comparing the weights of equal measured volumes of the liquid and water, or by comparing the weights of a glass ball in water and in the liquid. Specimens of floating bodies to show the position of stable equilibrium in different cases, *e.g.*, cylinders of wood or cork, some floating with the axis horizontal and some with the axis vertical, and with different degrees of stability. Air pump, with mercurial gauge. Glass tube closed at one end, and mercury for illustrating the pressure of the atmosphere, and of the vapours of different liquids. Syphon. Model of suction pump in which the action of the valves can be seen.

Subject VII.—Applied Mechanics.

In addition to the apparatus in the above list for Subject VI., the following:—*Folding diagram in cardboard, to show the principle upon which guide pulleys are arranged to convey an endless band from one pulley to another when the axes are not parallel. A reciprocating piece actuated by a crank and connecting rod arranged so as to show the variations in the motion which arise from different lengths of connecting rod, and also to exhibit "Booth's Motion." A crank and slit bar arranged to illustrate the reciprocating motion due to a crank and indefinitely long connecting rod. A cam arranged to give reciprocating motion with constant velocity ratio to a bar sliding between guides. A crank and slit bar with adjustments such that the uniform rotation of the crank may produce* (1) *angular oscillation of the slit bar;* (2) *rotation of the slit bar with varying velocity. The quick return motion of a shaping machine as derived from the slit bar mechanism. Frame with scale pan and weights for testing the strength of bars of wood, of different lengths and cross sections, when loaded transversely Simple apparatus to illustrate the laws of friction between two solid bodies.*

Additional Apparatus for Advanced Stage (Subject VII.).

Model of simple form of rope brake, with spring balance attached at one end and a weight suspended at the other end of the rope; the arc of contact of the rope to be capable of adjustment so as to illustrate coil friction. Model of a Warren girder, or of an N girder; the diagonal ties being made flexible (of string or wire). Three or more spur wheels in gear as an epicyclic train, with adjustments for altering the arrangement of the wheels.

Elementary Physics.

An alternative for the first or elementary stage of Subjects VIII. and IX.

Sound.

Tuning fork. Rod about ¾ in. diameter and not less than 4 ft. long. Deal sounding board. Wooden trough with glass front (to show wave motion). Caoutchouc tube about ½ in. wide and 12 ft. long, filled with sand. Two turned iron tubes about 3 ft. long and 4 in. in diameter, with supports. Humming top, fitted with iron plate pierced with two rows of holes and with tooth edge. Monochord, and set of weights, with 2 sets of brass and steel wires.

Light.

Gas jet, with pin-hole opening. Pin-hole camera. Wire pyramid, to illustrate law of inverse squares. Apparatus to illustrate the law of reflection. Concave glass mirror. Convex lens. Newton's colour disc, with spinning top. Glass prism.

Heat.

Thermometer. Unequal-expansion bar. Apparatus to show the unequal expansion of different liquids. Simple air thermometer. Differential thermometer. Set of cylinders, copper, tin, lead, iron, zinc, bismuth, cork, wood, for specific heats. Thermometer tubes. Brass tube.

Magnetism.

Bar magnet. Knitting needles to magnetize. Bar of soft iron. Magnetic needle on vertical pivot. Iron and steel filings.

Electricity.

Glass tube. Flannel and silk rubbers. Sticks of shellac and sealing wax. Amalgam. Electroscope. Electrical machine. Insulated conducting balls.

Grove's or Bunsen's battery, 4 cells at least. Strips of copper and zinc. Cotton-covered wire. Electrolysis of water apparatus. Electric bell.

Subject VIII.—Sound, Light, and Heat.

Sound (Elementary Stage).

Air pump. Alarum. Caoutchouc tube, about ½ inch wide and 12 feet long, filled with sand. Wooden trough with glass front; round trough (to show wave motion). Tuning fork. Rod, about ¾ inch diameter and not less than 4 feet long. Deal sounding board. Simple pendulum. Humming top, fitted with iron plate pierced with two rows of holes, and with tooth edge. 2 tinned tubes; pinhole gas-burner for sensitive flame; batswing burner (to show reflection of sound).

Sound (Advanced Stage).

Boyle's tube. Fire syringe. 2 tuning forks in unison. 1 tuning fork an octave higher. Iron table vice with cork-lined clamp. Square glass (or brass) plate for ditto. Violin bow. Monochord, and set of weights, with two sets of brass and steel wires. Deal and oak rods, each 6 ft. long by ½ in. Deal and oak rods, each 3 ft. long by ½ in. Glass tube, 3 ft. long by ½ in. 2 long measuring glasses to be tuned by water to resonate to the forks. Gas jet with small orifice and glass tubes for singing flames. Galton's whistle. Small mirrors to attach to tuning forks for Lissajous' figures and beats. Lantern.

Light (Elementary Stage).

Gas jet. Pinhole camera. Wire pyramid to illustrate law of inverse squares. Mirror turning about vertical axis, wooden arm and graduated paper for law of reflection. Two glass mirrors to be put at different angles for reflection. Two concave mirrors. Convex lens. Glass trough, with divisions, to show refraction. Two flat glass cells. Glass prism. Trough with lens to measure index of refraction. Lantern.

Light (Advanced Stage).

Model of goniometer, or spectroscope. Polished metal semi-circle mounted on wood painted white for caustics. Convex mirror. Glass trough to show critical angle. Set of lenses. Prisms of flint and crown glass. Carbon bisulphide prism. Selected concave and convex spectacle glasses to show Newton's rings. Rings, &c. to form soap films. Wooden model to illustrate Fresnel's interference bands. Simple polariscope. Differential air thermometer, with one bulb blackened to show heat due to absorption. Photographic printing frame, with two pieces of blue and red glass to expose. Glasses of different colours to show absorption. Coloured bodies to place in different parts of the spectrum. Phosphorescence tube. Wood painted with luminous paint. Colour disc. Wool test for colour blindness. Lantern.

Heat (Elementary Stage).

Cryophorus. Water hammer. Differential thermometer. Thermometer. Unequal expansion bar. Contraction apparatus, with bars. Metal bar and gauge to show expansion, or s'Gravesande's ring. Concave tin reflectors (2). Set of iron balls, with stand, for radiation experiments. Copper ball, with ring handle. Set of cylinders, copper, tin, lead, iron, zinc, bismuth, cork, wood, for specific heats. Leslie's cube. Thermometer tubes. Barometer tubes.

Heat (Advanced Stage).

Glass bulb and tube filled with coloured water, to show expansion of glass when suddenly heated. Lead and hammer to show production of heat. Thermopile and galvanometer. Metal rod with small air thermometers attached to show curve for measurement of conductivity. Steel mortar and close fitting pestle to make cylinders of ice. Wet and dry bulb thermometers. Blackened tin vessel for freezing mixture to show deposition of dew. Bright metal dish for spheroidal state. Small compression pump and and reservoir. Lantern.

Subject IX.—Magnetism and Electricity.

Magnetism

(*a*)Piece of magnetic iron ore. (*a*)Magnetic needle on vertical pivot. Dipping needle. Pair of bar magnets. (*a*)Horseshoe magnet. (*a*)Iron and steel filings. Pieces of soft iron. (*a*)Knitting needles to magnetize. (*a*)Compass card.

(*a*) *See* under Subject XXIII.

Frictional Electricity.

(*a*)Electrical glass tube. (*a*)Fur and silk rubbers. (*a*)Stick of shellac. (*a*)Stick of sulphur. (*a*)Stick of sealing wax. Brass tube or rod with rounded ends. Electrical machine, plate or cylinder. Amalgam. (*a*)Electroscope. Leyden jars. Leyden jar with moveable coating. Discharger. Sheet of caoutchouc. (*a*)Electrophorus. Pith ball electrometer. (*a*)Insulating stand, 2 conductors, cone, cylinder, and balls, to fit on stand. Roll of tinfoil on glass tube. Fulminating pane. Electric whirl.

Voltaic Electricity.

Strips of copper and zinc. Daniell's cell. Smee's cell. Grove's or Bunsen's battery, 4 or more cells. Copper wire, covered with cotton. Copper wire, covered with silk. Copper wire, covered with gutta-percha. Oersted's experiment. Electro-magnet. Pair of flat spirals on boards. Galvanometer. Model of single needle telegraph. Induction coil. Mercury, 2 lb. Electrolysis of water apparatus.

Subject X.—Inorganic Chemistry.

In the Elementary Stage of Inorganic Chemistry provision must be made for the satisfactory demonstration of such a course of experiment as is described in the outline of elementary instruction issued by the Department, and the experiments described in connexion with the alternative first course.

Subject X*p*.—Practical Inorganic Chemistry.

A list of the indispensable apparatus is given in the syllabus.

Subject XI*p*.—Practical Organic Chemistry.

A list of the indispensable apparatus is given in the syllabus.

Subject XII.—Geology.

Geological map of the British Isles. Geological *Survey* map (1 inch) of the district *in which School is situated, also any horizontal sections of Survey crossing the district. Small collections of rock-forming minerals. Rocks and fossils. The specimens should be typical and not too small in size. (3 to 4 inches across is a good size for teaching specimens.) Series of specimens suitable for teaching purposes have been prepared, and can be seen in the Science Division of the South Kensington Museum. Specimens can also be sent to Country Schools by the Science Circulation Division of the Science and Art Department.*

A box containing a collection of 16 *illustrations of Aqueous, Igneous, and Metamorphic Rocks. A box containing a collection of* 12 *common rock-forming minerals (for Elementary classes). Collection of* 20 *common rocks (for Elementary classes). Collection of* 12 *microscopic slides illustrating Physiographic Geology (for Elementary classes). Collection of* 12 *slides of typical rocks (for Elementary classes). Collection of* 20 *supplementary minerals (for Advanced classes). Two boxes each containing a collection of* 20 *supplementary rocks (for Advanced classes). Three boxes each containing a collection of* 60 *typical fossils (for Advanced classes). A cheap microscope is very desirable.*

Subject XIV.—Human Physiology.

An articulated skeleton, or a set of bones of upper and lower extremities and ribs. Diagram of the organs of circulation and respiration. Compound microscope. Dissecting instruments. Apparatus for simple experiments in

(*a*) *See* under Subject XXIII.

chemistry. The articles required are:—(*b*)Bunsen burner, rose and blow-pipe jet. (*b*)Platinum foil and wire. (*b*)Retort stands, each with a clamp and three rings, 2. (*b*)Sand bath. (*b*)Wire gauze, 2 pieces. (*b*)Cork borers, set of 6, and an iron rod. (*b*)Pneumatic trough. (*b*)China basins, 2. (*b*)Porcelain evaporating basin. (*b*)Bell jar (stoppered). (*b*)Flasks, 2 of 24 oz.; 3 of 16 oz.; 3 of 8 oz. (*b*)Test tube stand with holes and pegs for 12 tubes. (*b*)Test tubes, 12 of 6 inches by $\frac{3}{4}$ inch.

Subject XVII.—Botany.

Microscope, compound. Microscope, simple. Set of botanical diagrams.

Subject XVIII.—Principles of Mining.

I.—Coal Mining.

Specimens of the various varieties of coal (including anthracite, cannel coal, and brown coal), of the rocks occurring in the Coal Measures, and of a few typical fossils of the Coal Measures. Geological map of the British Isles showing the coalfields. Diagrams showing boring plant. Specimens of safety fuse and electric fuses. Diagrams showing methods of sinking through watery strata; diagrams showing methods of supporting excavations by timber, iron and steel, brickwork and masonry; diagram showing pillar and stall method of working; diagram showing longwall method of working. Sections of rails; a steel sleeper; wheel of an underground waggon and a pedestal. Specimens of hemp and wire ropes; and attachments of wire ropes (cappings). Models of disconnecting hooks. Model to illustrate pneumatic hoisting by Blanchet's system. Diagram illustrating the action of mining pumps, Cornish and direct-action engines. Diagram showing construction of a dam. Anemometer and water gauge. Model to illustrate action of water gauge. Model to illustrate action of a fan. Davy lamp, Clanny lamp, Marsaut lamp, and Hepplewhite-Gray lamp. Chesneau lamp. Chamber for showing "caps" on flame of safety lamp.

II.—Metalliferous Mining.

Specimens of ores and of the minerals commonly associated with them. Specimens of the common rocks and of gozzans.

Diagrams showing boring plant; actual tools if possible. Various "bits" used in machine drills. Diagram of a percussive rock drill worked by compressed air. Specimens of safety fuse and electric fuses; diagrams showing methods of sinking through watery strata; diagrams showing methods of supporting excavations by timber, iron and steel, brickwork and masonry; diagram showing pillar and stall method of working; diagram showing Longwall method of working. Diagram showing overhand and underhand stoping. Sections of rails; a steel sleeper; wheel of an underground waggon and a pedestal; specimens of hemp and wire ropes, and attachments of wire ropes (cappings); models of disconnecting hooks; model to illustrate pneumatic hoisting by Blanchet's system. Diagram illustrating the action of mining pumps, Cornish and direct-acting engines. Diagram showing construction of a dam. Anemometer and water gauge. Model to illustrate action of water gauge. Model to illustrate action of a fan.

Glass model to illustrate fall of bodies in water. Glass models to illustrate jigging. Diagrams of stone breakers, stamps, crusher and Frue vanner.

Many of the models can be made by the teacher himself for a few pence; and he should exhibit as far as possible actual tools and appliances, such as can be easily obtained in any mining district.

Subject XIX*p*.—Practical Metallurgy.

A list of the indispensable apparatus is given in the Syllabus.

Subject XXII.—Steam.

Mariotte's apparatus to illustrate Boyle's Law. Apparatus for experiments on latent heat of steam. Model of parallel motion with pantograph. N.B.—If

(*b*) *See* under Subjects XXIII. and XXIV.

this is not procurable, it may be replaced by the following (one or two varieties showing form in common use):—Parallel motion, five varieties: Beam engine; marine engine; small steam engine (a); Watt's engine; small steam engine.(b) Working model of beam engine; sectional model of locomotive engine. (These are very desirable, but if good diagrams be used, they will not be looked upon as indispensable.) Reversing gear.

Subject XXIII.—Physiography.

Much of the apparatus used in teaching Physics, Chemistry, and Geology will be available for Physiographic teaching. The following pieces of apparatus are recommended for teachers of Physiography. Maximum, minimum, and black bulb thermometers. Barometer. *Barometer tube with mercury, a cup and a wooden clip-stand for setting up a barometer before the class.* Rain gauge, simple. Ordnance survey map of district, showing contour lines. Terrestrial globe, not less than 12 in. diameter. Geological map of the British Isles. Apparatus for simple experiments in magnetism, electricity, and chemistry. The articles required are, *in addition to a mouth blow-pipe*, those marked (*a*) and (*b*) under the heads of Subjects IX. and XIV. *Collection of 12 common rock-forming minerals. Collection of 20 common rocks. Collection of 12 microscopic slides illustrating Physiography. Collection of 12 slides typical rocks. A cheap microscope. Diagrams illustrating terrestrial phenomena and astronomical objects.*

N.B.—A cheap telescope and a spectroscope also are very desirable.

Subject XXIV.—Principles of Agriculture.

Apparatus for simple experiments in chemistry. The articles required are marked (*b*), in addition to a mouth blow-pipe, those under the head of Subject XIV.

Subject XXV.—Hygiene.

In addition to apparatus for the illustration of Elementary Human Physiology classes should be provided with the following:—

Diagram showing classification of potable waters (Rivers Pollution Commission). Diagram showing permeable and impermeable strata, with shallow and deep wells in them. Diagram showing illustrations of water sediment. Diagram showing composition of inspired and expired air. Diagram showing action of Galton's grate with a ventilating shaft. Diagram showing method of ventilating the Houses of Parliament. Model of Ellison's air brick. Model of Sherringham's valve. Model of Tobin's tube. Diagrams showing various forms of traps. Model of a gully trap with movable bucket. (Example of a good trap.) Model of a common mason's or dip trap. (Example of a bad trap.) Models of junction pipes, curved or oblique. (Models of these can be had well glazed on inside.) Diagram showing a disconnecting manhole. *Diagram showing arrangement of privy or earth-closet with moveable receptacle, for cottage dwellings.* Diagram showing a wash-down water-closet pan. (Good form.) Diagram showing old pan closet with metal container and D trap. (Bad form.) Diagram showing good and bad system of drainage for a cottage dwelling. *Diagram showing house drain arrangements* (*a*) *for detached houses*, (*b*) *for semi-detached houses*, (*c*) *for attached houses.* Samples or models of water pipes. (*a.*) Block tin, (*b.*) Iron, (*c.*) Glazed iron. Diagram showing classification of food stuffs into their proximate elements. Diagram showing standard diets. (*a.*) Rest or sustenance, (*b*) ordinary work, (*c*) hard work. Diagram showing per-centage composition of common foods. Diagram showing classification of soils in order of healthiness. Diagram showing types of weather. (*a.*) Cyclones, (*b*) anti-cyclones, (*c*) V-shaped depressions, (*d*) wedges. Model of a barometer scale with vernier. Wet and dry bulb thermometers.

Form 91.
S.

RULES AND REGULATIONS FOR LOCAL SCIENCE EXAMINATIONS, APRIL AND MAY, 1895.

(The Rules for the Examinations in Irish Schools are contained in Form No. 91*b*; in Practical Chemistry in Forms Nos. 91*d*, 91*e*, and 91*f*; and in Practical Metallurgy in Form No. 91*m*.)

N.B.—No one has any authority to modify the following rules in any particular.

I.—RULES.

Directions to Superintendents of Examinations.

Who may act as Superintendents.

1. The examinations must be conducted by Superintendents, who must be either members of Approved Committees or Special Local Secretaries and their Assistants.

Number of Superintendents required.

2. Two Superintendents must be present in each room throughout the examination. Where there are more than fifty, but not more than one hundred, candidates in any room three Superintendents will be required in that room, and an additional Superintendent for every additional fifty, or fraction of fifty, candidates. In the case of an L or T-shaped room three Superintendents at least must be present even though the number of candidates in the room should be less than fifty.

Superintendents may relieve each other.

3. Superintendents may relieve one another, provided that the required number be always present. If the prescribed number of Superintendents be not present during the whole time of the examination it will be disallowed.

Attendance of Committee to identify students.

4. When a Special Local Secretary's Assistants act as Superintendents (*see* § XXIII. of the Directory), members of the Committee do not conduct the examination, but some of them should attend for a time on each evening that their school is examined to identify their own students.

Members of Committee supplying place of Special Local Secretary or Assistant.

5. When the examinations are conducted by a Special Local Secretary and his Assistants, each Committee must see that the examination of their class does not fail from accidental circumstances; in case of the unavoidable absence of the Special Local Secretary, or his Assistant, a member of the Committee should take his place.

Who allowed to be present.

6. Only Candidates, Superintendents, Members of the Local Committees, and Officers of the Department may be present at any examination.

Arrangement of Examination Room.

Allotting seats.

Diagrams to be removed.

7. Candidates must be seated so as to be *not less than* 5 *feet apart from each other from centre to centre.* The Superintendents must provide ink, pens, ruled foolscap-paper, and pins or paper fasteners. All diagrams, &c. having reference to the subjects of the examination must be removed from the walls of

the examination room. The examinations in Subjects I., II., III., and IV., should as far as possible be held in rooms with level floors, *i.e.*, without galleries. The General Register (Form No. 486) of each school under examination must be in the room. This Register contains the autograph signature of each candidate, and, in the event of any question arising as to the identity of any candidate, his signature on his examination paper slip should be compared with his signature in the General Register of his school. General Register required.

8. All these arrangements must be completed by 6.30 p.m. (*on the 27th April and 4th May by 5.30 p.m.*). Completion of arrangements.

Admission of Candidates.

9. The number of candidates admitted must not be in excess of the number of papers of questions for which due application has been made in accordance with the rules of the Directory. All the candidates must be seated by 6.50 p.m.; no one may be admitted afterwards, except under VERY EXCEPTIONAL CIRCUMSTANCES, and then *only* if no person who has seen the examination paper has left the room. No candidate must on any account be admitted after 7.30 p.m. (*On the 27th April and 4th May, these times will be 5.50 p.m. and 6.30 p.m. respectively.*) Admitting candidates.

If a candidate is admitted after the time fixed for the commencement of the examination, his name, the time of his arrival, and the exceptional circumstances under which he was admitted, must be stated on the certificate. (*See* page 139.)

10. The Superintendents may permit the teacher of the class to assist in getting the candidates into their places, and in seeing that they fill up the forms on the outside of their blank papers (*see* section 11). *He must, however, leave the room before the envelopes containing the examination questions are opened; his presence during any part of an examination, at which he is not himself examined, will involve the cancelling of such examination.* He should not be in or near the building where the examination is held while it is being conducted, unless he wish to be examined, in which case he must apply specially to the Superintendents to provide him with a table apart from the other candidates. Candidates may not bring anything into the examination room, except pens, india-rubber, and pencils, and such articles as are specified on the Time Table (Form No. 90). All books, note-books, &c., must be given up to the Superintendents before the examination questions are distributed. Teachers assisting in arrangements. Examination of Teacher. No books, &c. allowed.

Distribution of Numbered Forms.

11. The blank forms supplied for the candidates to write their answers upon should be first distributed, and the Superintendents should see that the candidates commence by filling in their names, &c. where directed. The arrangement of the candidates and the distribution of the blank papers should be completed before 6.50 p.m. (*on the 27th April and 4th May before 5.50 p.m.*), and should no candidate present himself for examination, or if for any other reason the packet of examination questions is not required, it must be returned to the Department by the next post **unopened.** Distribution of blank papers. Returning packet of questions if no examination held.

12. One of the numbered forms supplied by the Department is to be served out to each candidate to write his answers upon (which must be written in ink, except that in the case of Subjects I., II., III., and IV., the drawings may be done in pencil); when he has filled the whole of this form, he may be supplied with blank foolscap; this should be fastened to the form which the candidate has already filled up, by a Superintendent, who should take care to mark it at the top with the same number as on that form. In Subjects I., II., III., and IV., no more than *one* numbered sheet of drawing paper is to be given to each candidate, but this may be supplemented by as much blank foolscap as the candidate requires, the foolscap being marked as above mentioned; to candidates in Honours of these subjects a piece of clean blotting paper may also be supplied, which, however, must be returned with the worked paper. Additional foolscap paper allowed. Use of drawing and foolscap paper.

Conduct of the Examination.

Reading regulations.

13. At 6.50 p.m. (*on the 27th April and 4th May at 5.50 p.m.*) the regulations on page 137 of this form are to be read to the candidates.

Examining and opening packets of questions.

14. At 6.55 p.m. (*on the 27th April and 4th May at 5.55 p.m.*) each packet of examination questions must be carefully examined by each Superintendent before it is opened, and he must ascertain that it has not been tampered with. The packets must then be opened in the examination room. *Under no circumstances whatever may a packet of examination questions be opened when one Superintendent only is present; such a course alone suffices to annul the examination.* At 7 p.m. (*on the 27th April and 4th May at 6 p.m.*) the examination questions must be distributed, and on those evenings on which there are two or more subjects of examination, special care must be taken that no student has a paper of questions in more than one subject. *No paper of questions may be given to any candidate until he has filled up the slip attached to his numbered form, and this numbered form, with slip attached, must be returned to the Department, even if the candidate does no work on it.* No paper of questions may on any pretext be taken from the room until every candidate shall have completed and given up his worked paper.

Only one paper of questions allowed.

Vigilant and silent supervision necessary.

15. The Superintendents must give their whole attention to the examination, and must carefully watch to see that candidates use no unfair means, either by assisting one another, by using books or notes, or otherwise. They are also requested not to talk unnecessarily, as it tends to disturb the candidates, nor should observations be made on the candidates' work. It is advisable that Superintendents should not remain seated in one place during the examination, and one of them should as often as possible place himself *behind* the candidates.

Collecting and initialing worked papers.

16. At 10 p.m. (*on the 8th May at 10.30 p.m.*), or as much sooner as all the candidates have completed their papers, the worked papers must be collected. Before he takes a paper from a candidate a Superintendent must see that the slip is properly filled up and then initial it in order to prevent personation; he must be careful not to treat this duty as a mere matter of form. A candidate who has given up his paper must at once leave the room.

Fastening up the worked papers' bag.

17. The worked papers, together with the certificate on page 138 duly filled up, must be fastened up in the canvas bag supplied by the Department for that purpose *in the presence of at least two Superintendents.* When an examination is held in more than one subject on the same evening at the same centre, the worked papers for each subject should be fastened up in a separate bag. Before the bag is thus made up no person who is not a Superintendent must enter the room. Should the examination have commenced late, no allowance can be made, but the papers *must be collected punctually at* 10 *p.m.* (*on the 8th May at* 10.30 *p.m.*). FAILURE TO COLLECT THE PAPERS AT THE PRESCRIBED TIME WILL, IN ALL CASES, ANNUL THE EXAMINATION. No extension of the time of collection can be granted by any one.

Posting the papers.

18. At the conclusion of each examination it will be the duty of some one of the Superintendents to post the parcel of worked papers, at the nearest district or branch post office, and this duty must not be deputed to any other person. If unable to post the parcel overnight, it should be kept in safe custody, and posted at the nearest post office by the first post next morning.

II.—Regulations.

To be read to the Candidates on each evening before the packets of Examination Questions are opened.

1. Before commencing your work you are required to fill up the printed form which is attached to the blank examination paper.

2. You may not have with you any books, notes, or scribbling paper.

3. You are not allowed to write or make any marks on your paper of questions, or to take it away before the close of the examination.

4. You must not, under any circumstances whatever, speak to or communicate with one another, and no explanation of the examination paper may be asked or given.

5. You must remain seated until your paper has been collected, and then quietly leave the examination room. But none of you will be allowed to leave before the expiration of one hour from the commencement of the examination.

6. Your papers, unless previously given up, will all be collected at 10 o'clock.*

7. If any of you use unfair means, or break any of these rules, you will be expelled, and your paper cancelled.

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* On the 8th May read 10.30 o'clock.

For the certificate to be signed by the Superintendents of the Examination see next page.

III.—Certificate by the Superintendents of Examination.

To be filled in and signed by the Superintendents, and forwarded with each set of worked papers.

We, the undersigned Superintendents of the Science Examinations held at [1] _____ hereby certify that we were present during the examination in [2] _____ on the evening of the [3] _____ when [4] _____ candidates presented themselves; that the seal(s) of the [5] _____ envelope(s) containing the examination questions (was/were) broken at [6] ____ p.m.; that the accompanying papers were worked in our presence, and all collected by [7] ____ p.m., and fastened up in the bag in the presence of at least two Superintendents, and that the foregoing rules and regulations, as far as they applied during our presence, have been strictly complied with.

[1] Name of building and town.
[2] state subject.
[3] Date.
[4] Number.
[5] State number of envelopes opened.
[6] and [7] Exact time.

Dated this ____ day of _____ 1895.

Note.—A separate certificate is required to be filled up for each examination room should more than one be used. Every person—other than the Candidates and the Officers of the Department—who is present *at any time* during the Examination, should sign the above certificate. Should a Superintendent leave the examination room and return to it, the time of his first arrival and departure, and of his second arrival and departure, should be exactly stated.

Exactness in filling up this certificate will obviate correspondence and delay in the issue of results. The slightest deviation from the letter of the foregoing rules must be reported.

Signatures.	State whether a Special Local Secretary, a Special Local Secretary's Assistant, or a Member of the Committee.	If a Member of Committee, state School No.	Time Present.			
			Hour of Arrival.		Hour of Departure.	
			H.	M.	H.	M.

Admission of Late Candidates.

(See § 9 on p. 135.)

Names of Candidates admitted Late.	Time when admitted.		Reasons for Lateness.
	H.	M.	

Certificate of Closing of Bag.

(See § 17 at p. 136.)

To be signed by the Superintendents present at the close of the Examination.

The worked papers have been all placed in the bag, which is now about to be closed at (Insert time) H. ____ M. ____ p.m. in the presence of

CLAIM FOR PAYMENTS ON RESULTS OF EXAMINATIONS, 1895. (SCIENCE.)

(To be sent in before 31st October 1895.)

School Number. 4,890.	Form 51. S.	No. of Voucher. / Registry Stamp.

Application for Payment from Mechanics' Institute, [Name of school or institution.]

at Ashton-Carlton [Name of town or village.]

Number of individual students of the above School examined in SCIENCE at examinations in April and May, 1895.—25.

On behalf of the Committee of this School, We, the undersigned Members, certify:—

(1.) That the following Teacher(s), viz., Messrs. William Brown, John Jones, and Francis Robinson {have / has} duly performed the various duties devolving upon {them / him} as (a) Science Teacher(s) in the School during the year ended May 1895; that {they have / he has} given to the class not less than 28 lessons during the session and before the examination in each subject in which a claim is made; and that each of such lessons was of at least one hour's duration (or if in Practical Chemistry or Practical Metallurgy of at least one and a half hour's duration) and was given on a separate day.

(2.) That each of the individual students claimed upon has received at least 20 lessons of not less than one hour's duration each (or if in Practical Chemistry or Practical Metallurgy of not less than one and a half hour's duration each), during the session (or since the last examination in the subject at which the student was successful), in each subject for which payment on account of the student is claimed; and that all the lessons on which the claim is based have been duly registered and have been given within the two years ended May 1895, and in classes supervised by our Committee.

(3.) That no claim is made on account of any student who is a pupil on the registers of an Elementary School receiving aid from the English or Scotch Education Departments unless such pupil had passed Standard VI. of the English or Scotch Codes respectively, or had been placed altogether in Standard VII. of the English Code on or before the 1st January 1895,*

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* *In the claims for session* 1895–1896 *the date will read* 1*st November* 1895.

and prior to being registered as a student of a Science class; and no claim made on account of a success in any subject in which the student has been examined, since the 1st August 1894, by the English or Scotch Education Departments for a class or specific subject grant or by the Commissioners of National Education in Ireland for an extra branch fee.

(4.) That no claim is made in Stage 1 of Mathematics on account of any male student who is, or has been, a Pupil Teacher or an Assistant Teacher in a Public Elementary School under the English or Scotch Education Departments, or who has been trained as a teacher at the public expense, *i.e.*, in a State-aided Training College.

(5.) That the students claimed on belong to the classes on whom payments are made according to the rules of the Directory; that is to say, they come within one or more of the following categories, viz.:—

a. Persons in the receipt of weekly wages, and their children not gaining their own livelihood.

b. Teachers and pupil-teachers of elementary schools in connexion with the English or Scotch Education Department, or the Board of National Education, Ireland, and their children, if not gaining their own livelihood. (*See exceptions in* § 21 *at p.* 32, *and the special rules applying to Irish National School teachers at pp.* 59–62 *of the Directory.*)

c. Persons in the receipt of not more than 400*l.* a year from all sources (*i.e.*, who are allowed an abatement of the income tax), and their children if not gaining their own livelihood.

d. Scholars in public elementary schools within the meaning of the Elementary Education Acts, and scholars who on leaving the elementary school are proceeding with their education in Science or Art Schools or Classes.

e. Students in an organised Science School (see §§ 22–28, at p. 33, *et seq.* of the Directory) under public management, or in a night class for Industrial students which meets after 6 p.m., or on Saturdays after 2 p.m.

(6.) That each of the teachers is duly qualified according to sections 5 and 5*a*, pp. 24-26 of the Directory (revised to June 1894), to earn payments in each of the subjects taught by him.

Examined and certified at a meeting of the Committee held for that purpose at Ashton-Carlton, on the 8th day of August 1895.

John Richards, Chairman of Meeting.
Alfred H. Dickson.
Walter Harrison.
} Autograph signatures of three approved members of the Local Committee present at the meeting.

(*The following will be filled up by the Department.*)

Subhead of Vote D 1.

Certified correct

Pay to _____ £ :

_____ Certifying Officer.

N.B.—The names of the students must be arranged alphabetically, and against each name must be placed—using a separate line for each success—the particulars of the several successes (if more than one) on which a claim is made; and in the last column the payment claimed on each of such successes after making the proper deductions. Only the names of those students, and the particulars of the successes on account of which a claim is made, should be entered hereon.

No claim on account of a success in Stage 1 of Mathematics (V.) can be allowed on account of male students who are or have been Pupil Teachers or Assistant Teachers in Public Elementary Schools under the English or Scotch Education Departments, or who have been trained as teachers at the public expense, *i.e.*, in a State-aided Training College.

Student's No. on General Register.	No. of registered Attendances.	Names of Students claimed on (in strict alphabetical order). Surname.	Christian Name(s) in full.	Age last Birthday.	Category a, b, c, d, or e under which Claim is made	Particulars of Successes claimed on. Success at the late Examination. Subject.	Stage.	Class.	Highest success in same Subject in any previous Examination. Stage	Class.	Payment claimed. £ s.
20	27	Adams -	John James.	15	a.	I.	E. § 1	Pass	—	—	0 10*
	24	„ -	„	„	„	V	1	Pass	—	—	2 0
	26	„ -	„	„	„	VI. a.	E.	Pass	—	—	2 0
						X.	A.	2	Alt.	Pass	2 10
14	26	Carter -	William Henry.	22	c.	X.	A.	1	E.	1	5 0
	20	„ -	„	„	„	X. p.	A.	2	—	—	3 10
3	25	Jones -	Richard	23	a.	I.	E.	Pass	—	—	2 0
	28	„ -	„	„	„	II.	A.	1	A.	2	2 10
18	30	Robinson	Peter Charles.	20	a.	I.	A.	2	E.	2	2 10
	30	„	„	„	„	II.	A.	1	E.	Pass	5 0
	28	„	„	„	„	XXII.	E	Pass	—	—	2 0
21	26	Smith -	Robert -	16	d.	VI. b.	A.	2	—	—	2 10
	25	„ -	„ -	„	„	XXIII	E.	Pass	—	—	2 0
25	27	„ -	Susan -	17	d.	XIV.	E.	Pass	E.	2	1 0
8	30	Thomson	Charles	14	a.	VIII. & IX.	Alt. E.	Pass	—	—	2 0
19	30	„	George -	19	e.	I.	A.	2	E.	Pass	2 10
	26	„	„ -	„	„	V.	2	2	1	Pass	2 0
2	22	Thomp-son.	Henry -	16	e.	II.	A.	2	E.	Pass	2 10
	24	„	„ -	„	„	VII.	E.	Pass	—	—	2 0
4	30	Watson	William	18	b.	V.	2	1	—	—	3 0
	26	„	„	„	„	X.	A.	2	E.	Pass	2 10
	26	„	„	„	„	X. p.	E.	Pass	E.	2	2 0
7	29	Williams	Charles	21	e.	VII.	A.	1	A.	2	2 10
5	28	Young -	Arthur -	26	b.	V.	3	1	3	2	1 0
	26	„ -	„ -	„	„	VI. a.	A.	2	E.	1	2 10
	26	„ -	„ -	„	„	VI. b.	E.	Pass	—	—	2 0
	24	„ -	„ -	„	„	XXIII	A.	1	A.	2	2 10
22	30	„ -	Henry -	20	a.	X.	A.	2	E.	Pass	2 10
	30	„ -	„	„	„	X. p.	A.	1	A.	2	2 10
17	28	„ -	Ruth -	18	„	XIV.	E.	Pass	—	—	2 0
											£71 0

* *Owing to the altered regulations, this payment will not be claimable in the session* 1895-1896 *as a Science grant.*

APPENDIX C.

REPRINT *of the* Art Form 965*c*
for May 1895.
(*Under revision for the Examinations of* 1896.)

RULES AND REGULATIONS FOR LOCAL ART EXAMINATIONS APRIL AND MAY 1895.

N.B.—No one has any authority to modify the following rules in any particular; they must be carried out to the letter.

I.—RULES.

DIRECTIONS TO SUPERINTENDENTS OF EXAMINATIONS.

Who may act as Superintendents.

1. The examinations must be conducted by Superintendents, who must be either members of approved Local Committees or Special Local Secretaries and their Assistants. But no persons who have relatives to be examined within their district may act as Superintendents.

Number of Superintendents required.

2. Two Superintendents must be present in each room throughout the examination, except that *when there are not more than* 15 *candidates who can be all accommodated in one room, the examination in any of the following subjects;—2b, 3a, 3b, 5a, 5b, Drawing the Antique from Casts, Drawing from Life, Painting from Still Life, and Modelling from the Antique and from Life, as well as Casting for any of the Modelling Subjects, may be conducted by one Superintendent alone.* When there are more than 50, but not more than 100, candidates in any room, three Superintendents will be required in that room, and an additional Superintendent for every additional 50, or fraction of 50, candidates. In the case of an L or T shaped room three Superintendents at least must be present, even though the number of candidates in the room should be less than 50.

Superintendents may relieve each other.

3. Superintendents may relieve one another, provided that the required number be always present. If the prescribed number of Superintendents be not present during the whole time of the examination it will be disallowed.

Attendance of Committee to identify students.

4. When a Special Local Secretary's Assistants act as Superintendents (*see* Science and Art Directory, par. XXII.–V.), members of the Local Committee do not conduct the examination, but some of them should attend for a time on each occasion on which their school is examined to identify their own students.

Member of Committee supplying place of Special Local Secretary or Assistant.

5. When the examinations are conducted by a Special Local Secretary and his Assistants, each Local Committee must see that the examination of their class does not fail from accidental circumstances; and in case of the unavoidable absence of the Special Local Secretary or his Assistant, a Member of the Committee should take his place.

Where there is no Special Local Secretary, a member of the Local Committee, or a Superintendent previously nominated by the Local Committee and approved by the Department, may be appointed to conduct the examination in *Painting from Still Life*, on 7th May, from 10 a.m. to 4 p.m., and to supervise the *Casting from Models* (when done during the day time) on the 18th, 21st, 25th and 29th May. He may be paid a fee of half a guinea, one moiety of which must be contributed by the locality. (See § 18, p. 72, of the Science and Art Directory.)

Who allowed to be present.

6. Only Candidates, Superintendents, Members of the Local Committees, and officers of the Department of Science and Art may be present at any examination.

ARRANGEMENT OF EXAMINATION ROOM.

Space to be allotted to each candidate.

7. Candidates must be so placed as to be *not less than five feet apart from each other from centre to centre* at the examinations in Anatomy, Principles of Ornament, Perspective, Design, Architecture, Historic Ornament, Drawing the Antique from Memory, Painting in Monochrome, Modelling Design, and

Architectural design. At the examinations in subjects *2b*, *3a*, *3b*, *5a*, *5b*, Drawing and Modelling from the Antique, Drawing and Modelling from the Life, and Painting from Still Life, candidates much be placed so as to be *not less than two feet six inches apart from each other from centre to centre.* The Superintendents must provide ink, pens, tracing paper, ruled foolscap paper, pins or paper fasteners, and necessary materials, such as stands, nails, &c., for hanging up the Casts supplied by the Department for Subjects *3b*, *5b* (Elementary and Advanced Stages), and Modelling from the Antique. Each Cast will have its hanging loop. Before the boxes of Casts are opened on each evening Candidates' seats must be arranged opposite and about three feet away from the places for hanging up the Casts from which the candidates are to draw. All diagrams, &c., having reference to the subjects of the examination, must be removed from the walls of the examination room, and nothing must be allowed to be within sight of the candidates which may in any way assist them. The General Register (Form No. 486) of each school under examination must be in the room. *Superintendents must carefully study and make themselves well acquainted with the confidential and special instructions issued in respect of preliminary arrangements which have to be carefully made for many of the Art Examinations.* The Instructions must be strictly observed *by Superintendents, and on no account may the Superintendents communicate them to any one.*

Diagrams to be removed.

General register required.

8. The packages or cases containing the special casts or canvases for the examinations in Subjects *3b*, *5b*, Painting in Monochrome, and Modelling from the Antique, must be opened in the examination room not more than one hour before the commencement of the examination in those subjects; the casts must be at once hung up in the appointed places (See 7), and all preliminary arrangements must be completed half an hour before the commencement of the examination on each evening or day.

Opening of cases containing special canvases or casts.

9. The Superintendents may obtain the assistance of the Teacher, but only an hour or so before the examination commences, in the preliminary arrangements for the examinations.

Teachers assisting in arrangements.

Admission of Candidates.

10. The number of candidates admitted to each examination must not be in excess of the number for whose examination due application has been made in accordanbe with the rules of the Directory. Candidates may not bring anything into the examination room except india-rubber and pencils, and such articles as are specified on the Time Table, Form No. 90 (Form No. 90A for Ireland). Candidates for each subject must be in their places 10 minutes before the time prescribed in Form No. 90 (Form No. 90A for Ireland) for the examination to commence. The Superintendents may permit the Teacher to assist in getting the candidates into the places *assigned to them by the Superintendents. The Teacher must leave the room before the registered envelope containing the examination questions is opened; his presence during any part of an examination at which he is not himself examined will involve its being cancelled.* He should not be in or near the examination room while the examination is going on, unless he is himself a candidate for examination, in which case the Superintendents must provide him with a table apart from the other candidates. All books, note books, &c., must be given up to the Superintendents before the examination questions or examples are distributed.

Admitting Candidates.

Examination of Teachers.

No Books, &c., allowed.

11. No one may be admitted after the examination has commenced, except under VERY EXCEPTIONAL CIRCUMSTANCES, and then *only* if no person who has seen the examination questions has left the room. No candidate must on any account be admitted later than half-an-hour after the commencement of the examination.

If a candidate is admitted after the time fixed for the commencement of the examination, his name, the time of his arrival and the exceptional circumstances under which he was admitted, must be stated on the certificate.—(See page 143.)

Distribution of Numbered Papers.

Distribution of numbered papers.

12. The numbered papers or canvases supplied for the use of the candidates should be first distributed, and the Superintendents should see that the candidates commence by filling in their names, &c., where directed. The distribution of the numbered papers or canvases should be completed ten minutes before the time fixed for the examination to begin. Should no candidate present himself for examination, or if for any other reason the registered envelope of examination questions is not required, it must be returned to the Department by the next post UNOPENED.

Returning packet of questions or examples if no examination held.

Conduct of the Examination.

Opening packets of examination questions or examples.

13. Five minutes before the time fixed for the commencement of the examination in each subject, each registered envelope containing the examination questions must be carefully scrutinized by each Superintendent before it is opened, and he must ascertain that it has not been tampered with. It must then be opened by the Superintendents in the examination room. But *under no circumstances whatever may a registered envelope of examination questions be opened when one Superintendent only is present (except as stated in par. 2); such a course alone suffices to annul the examination.*

Reading regulations.

THE REGULATIONS PRINTED ON THE EXAMINATION PAPER, OR ON THE PAPER OF SPECIAL INSTRUCTIONS, FOR EACH SUBJECT, MUST BE READ TO THE CANDIDATES IMMEDIATELY BEFORE THE EXAMINATION COMMENCES. The examination questions or examples must then be distributed. *No paper of questions or examples may be given to any candidate until he has filled up the slip attached to his drawing paper, foolscap form, or canvas, and the drawing paper, foolscap form or canvas, with slip attached, must be returned to the Department, even if the candidate does no work on it.* No paper of questions or examples may on any pretext be taken from the room until every candidate shall have completed and given up his work.

Perspective, Historic Ornament, Architecture.

14. Each candidate in Perspective, Historic Ornament, and Architecture must be supplied with white foolscap sheets, specially provided, in addition to the numbered drawing paper; and he must write on the foolscap sheet the number printed on his drawing paper, and fasten the foolscap sheet to it.

Principles of Ornament. Design.

15. In the examinations in Principles of Ornament and Design, candidates who ask for them may be provided with pieces of tracing paper; but care should be taken by the Superintendents that no improper use is made of the tracing paper, such as the passing of sketches from one student to another. The candidate must write on the tracing paper the examination number printed on his drawing paper, to which it must be securely fastened and given up.

Vigilant and silent supervision necessary.

16. The Superintendents must give their whole attention to the examination, and must carefully watch to see that candidates use no unfair means, either by assisting one another, by using books or notes, or otherwise. They are also requested not to talk unnecessarily, as it tends to disturb the candidates, nor should observations be made on the candidates' work. It is advisable that Superintendents should not remain seated in one place during the examination, and one of them should as often as possible place himself BEHIND the candidates.

Collecting and initialing worked papers.

17. At the end of the time prescribed for each examination, or as much sooner as all the candidates have completed their papers, &c. the worked papers, &c. must be collected. Before taking a paper, canvas, or cast from a candidate a Superintendent must see that the slip is filled up, and then initial it in order to prevent personation; HE MUST BE CAREFUL NOT TO TREAT THIS DUTY AS A MERE MATTER OF FORM. A candidate who has given up his work must at once leave the room.

Time allowed for working.

18. The time allowed for the examination in each subject must not exceed that stated in Form No. 90 (in Form No. 90A for Ireland). Should the examination have commenced late, no allowance can be made, but the papers,

canvases, or casts, must be collected punctually. FAILURE TO COLLECT THE PAPERS, CANVASES, OR CASTS, AT THE PRESCRIBED TIME, WILL, IN ALL CASES, ANNUL THE EXAMINATION. The exact times of distribution and collection must be carefully entered in the certificate on page 142, *a separate Form of certificate being used for each subject.*

19. At the close of each examination the worked papers, canvases, or casts, together with the certificate, duly filled up and signed, in respect of each subject, must be made up for despatch *in the presence of at least two Superintendents* (*except as stated in par.* 2). The canvas bags provided for drawings must be carefully fastened in the manner described in the instructions issued with each bag. When an examination is held in more than one subject on the same evening at the same centre, the worked papers for each subject must be fastened up in a separate bag. Canvases must be packed in the boxes specially provided for them, and care must be taken in packing that the surfaces of the paintings may not touch one another. Casts must be packed in the necessary packing cases and materials provided by the Superintendents. Return of worked papers, &c. to Department.

20. BAGS AND PACKAGES CONTAINING THE CANDIDATES' WORK MUST BE DESPATCHED BY THE FIRST POST OR FIRST DELIVERY AFTER THE CLOSE OF EACH EXAMINATION, and it will be the duty of some one of the Superintendents to see to this despatch each evening, or as specially allowed by the rules; and this duty must be performed by a Superintendent, and no other person. Posting the papers

21. AT THE CONCLUSION OF THE LAST EXAMINATION held at a school or centre all the unused material, &c., which have been supplied by the Department must be carefully packed up and returned to the Department.

II.—REGULATIONS.

The Regulations to be read to the Candidates immediately before the Examination in each subject commences are printed on the paper of Examination Questions or confidential Special Instructions issued for each subject.

N.B.—A separate certificate on page 142 must be filled up for each subject, signed by the Superintendents, and forwarded in the bag or case containing the worked papers, canvases, or casts.

FORM 965*c*.
ART.

FORM OF CERTIFICATE TO BE FILLED IN AND SIGNED BY SUPERINTENDENTS OF LOCAL ART EXAMINATIONS, 1895, AND RETURNED TO THE DEPARTMENT WITH THE WORKED PAPERS, CANVASES, OR CASTS IN EACH SUBJECT.

N.B.—A separate form of Certificate is to be used for each subject of Examination.

[1] Name of institution and town.

We, the undersigned Superintendents of the Art Examination, held at [1] _____ hereby certify that:—

[2] State subject.
[3] State dates.
[4] State number of papers, or canvases.

(1) We were present during the Examination in [2] _____ on the [3] _____ day(s) of _____ 1895, when the *accompanying [4] _____ {* papers / canvases} were worked in our presence.

[5] State number.

* Models for the accompanying [5] _____ casts were made, and each candidate cast his own work in our presence.

* Erase the words that do not apply.

(2) The envelope containing the examination *questions or *examples was opened at _____h._____m., on the_____day of_____1895.

(3) *The candidates commenced to *draw or *paint at_____h._____m., and their {* papers / canvases} were collected at_____h._____m.

* The candidates commenced to work at their models at_____h._____m., on the_____day of_____1895, and commenced making casts from their models at_____h._____m., and the casts were collected at _____h._____m., on the _____day of_____1895.

(4) The foregoing rules and regulations of the Department relative to the Examination in this subject as far as they applied during our presence have been strictly complied with.

Dated this_____day of_____1895.

NOTE.—A separate certificate is required to be filled up for each examination room should more than one be used. Every person—other than the candidates under examination and the officers of the Department—who is present *at any time* during the examination, should sign the above certificate. Should a Superintendent leave the examination room and return to it, the time of his first arrival and departure, and of his second arrival and departure, should be exactly stated.

Exactness in filling up this certificate will obviate correspondence and delay in the issue of results. No deviation from the foregoing rules is allowed, but if, from unavoidable circumstances, any deviation should have occurred, it must be reported.

SIGNATURE.	State whether a Member of the Committee, a Special Local Secretary, or an Assistant.	If a Member of Committee, state School Number.	Time present.				Date.
			Hour of Arrival.		Hour of Departure.		
			H.	M.	H.	M.	

ADMISSION OF LATE CANDIDATES.

NAMES.	Time when admitted.			Reasons for Lateness.
	H.	M.	Date.	

NOTES OF VISITS BY MEMBERS OF LOCAL COMMITTEES.

CLAIM FOR PAYMENTS ON RESULTS OF ART EXAMINATIONS, 1895.

N.B.—All payments due to this School or Class on account of Art Examinations, including Art and Science School Works, must be claimed on this one Form.

School Number.	Form 526. Art.	No of Voucher. / Registry Stamp.

Application for Payment from _____ [Name of School or Institution.]

at _____ [Name of town or village.]

* Insert No. of individual students examined in Art.

Number of individual students of the above School of Art, or Art Class, examined in Art in April or May 1895 :— _____ *

On behalf of the Committee of Management of this School of Art, or Art Class, We do hereby certify :—

(1.) That the following Teacher(s), viz. :—

† Insert names and qualifications of Teacher(s).

†Names _____ Qualifications _____
" _____ " _____
" _____ " _____

{have / has} duly performed the various duties devolving upon {them / him} as (an) Art Teacher(s) in the School, during the year ended May 1895, and that {they have / he has} given to the class not less than 28 lessons during the session and before the examination in each group of Art subjects in which a claim is made; each of such lessons being of at least one hour's duration on a separate day.

(2.) That {they have / he has} given each of the students named in this claim at least 20 such lessons, of not less than one hour's duration each lesson, during the session, or since the student's last success in each group of Art subjects in which payment is claimed; all the lessons on which the claim is based have been given during the two years immediately preceding the year of examination, and in classes supervised by our Committee.

(3.) That the under-mentioned students belong to the classes on whom payments are made according to the rules of the Science and Art Directory, that is to say, they come within one of the following categories :—

a. Persons in the receipt of weekly wages, and their children if not gaining their own livelihood.

b. Teachers and pupil-teachers of elementary schools in connexion with the English or Scotch Education Departments, or under the Commissioners of National Education, Ireland; and their children if not gaining their own livelihood.

c. Scholars who on leaving a Public Elementary School are proceeding with their education in Science or Art Schools or classes.

d. Persons in the receipt of not more than 500*l.* a year from all sources, *i.e.*, who are allowed an abatement on the income tax, and their children if not gaining their own livelihood.

e. Students in a night class for industrial students which meets after 6 p.m. or on Saturdays after 2 p.m.

(4.) That the teacher(s) { is / are } duly qualified, according to §§ 8 and 9, at p. 63 of the Science and Art Directory of 1894, to earn payments in each of the subjects taught by { him / them }.

Examined and certified at a meeting of the Committee held for that purpose at*_____ on the †_____ day of_____ 1895.

* Insert place of meeting.

† Insert date.

_____
Chairman of Meeting.

_____
_____

{ Autograph Signatures of *three* Members of the approved Local Committee present at the Meeting.

The following will be filled up at the Department.

Entered *D* 2.

Certified correct.

Pay to_____ £ : :

_____

_____ Certifying Officer.

_____

The names of the students must be arranged alphabetically.
A SEPARATE LINE should be used for each amount claimed.
Abbreviations should be used to indicate the subject of Examination, thus:—

Model Drawing (*Elementary and Advanced Stages*).	M.	Historic Ornament, Subject 22*d* -	H.O.
Freehand Drawing of Ornament (*Elementary and Advanced Stages*).	F.	Painting from Still Life, Subject 15	P.S.L.
Drawing in Light and Shade, Subject 5*b*. (*Elementary and Advanced Stages*).	L.S.	Painting Ornament in Monochrome, Subject 11*a*.	P.O.M.
Anatomy, Subject 9 - - -	Anat.	Drawing the Antique from Memory, Subject 8*f*.	A.M.
Principles of Ornament, Subject 22 (*Elementary and Advanced Stages*).	P.O.	Architectural Design, Subject 23*b* -	A.D.
Perspective, Subjects 1*c* and 1*e* (*Elementary and Advanced Stages*).	P.	Modelling (*Elementary Stage*), Subject 18*a*.	Mod. 18*a*.
Design, Subjects 23*c* and 23*d* (*Elementary and Advanced Stages and Honours*).	D.	Modelling from the Life, Subject 19*h*	Mod. L.
Drawing from the Antique, Subject 8*b*[2].	A.	Modelling from the Antique, Subject 19*i*.	Mod. A.
Drawing from the Life, Subject 8*c*[3]	L.	Modelling, Design, Subjects 23*e* and 23*f* (*Elementary and Advanced Stages and Honours*).	Mod. D.
Architecture, Subject 1*d*. - -	Arch.		

1. Student's No. in School Register.	2. Names of Students in alphabetical order.		3. Age.	4. Category of each Student; give index letter, see (3).	5. No. of regd. attendances in groups of Art Subjects.		6. Successes obtained at the Personal Art Examinations, 1895.			7. Highest success in same or corresponding Subject in any previous Examination.	8. Amount claimed.	9. Payments of 3*l*. on account of Free Student, or Local Scholar.	10. 5*l*. on account of Nat. Scholar, Student in training, or Royal Exhibitioner.	11. Payments of 40*s*. or more up to 60*s*. per Student on account of works.
	Surname.	Christian Name.			No. of Attces.	Group.	Subject.	Stage.	Class.					
											£ *s.*	£	£	£ *s.* *d.*

The following will be filled up at the Department :—

The Art pupil-teacher(s) { is / are } qualified and { his / their } appointment(s) duly approved by the Department according to the terms of par. 33 (*b*), Science and Art Directory, 1894. There are _____ satisfactorily taught students of the industrial classes of which _____ are named in the claim and _____ are not named, payment for them being included in the lump sum £ _____ for works.

The students _____

in respect of whom free-studentships are granted are either draughtsmen, designers, modellers, or handicraftsmen, have each gained a first class in the immediately preceding personal Art Examinations in the Advanced Stage, or a first class in subjects not divided into Stages, and on account of whose works a payment of at least 2*l.* has been awarded at the preceding annual examination, have attended the School of Art for two consecutive years, are prepared to attend regularly for the year following the date of their appointment, and are recommended by the local committee of the school who have undertaken to admit them to the school without payment of fees for that year. (*See* par. 33*a*, p. 74, and par. 45, p. 76, Science and Art Directory, 1894.)

APPENDIX D.

Syllabus of the Subjects in which Examinations in Science are held by the Department of Science and Art.

SYLLABUS OF THE SCIENCE SUBJECTS.

The following Syllabuses have been prepared in order to afford candidates some guide to their reading; but it must be understood that the questions in the examination need not necessarily be on the specific points enumerated.

The examination is by paper, but *vivâ voce* examination may be resorted to. The examination in each subject is distinct.

These Syllabuses can be had at 1*d.* each, or 6*d.* a dozen.

[*See* list of publications at end of Directory.]

SCIENCE SUBJECT I.—PRACTICAL PLANE AND SOLID GEOMETRY.*

The examination questions will be given with the object of testing the candidate's knowledge of the **principles** of the subject, and in order to obtain a class it will not be sufficient to have merely learned a few problems by heart. In awarding marks, the neatness and general style of the drawing will be taken into consideration.

In addition to the questions in Practical Geometry a few questions in Graphic Arithmetic or Statics will be given in each stage. These questions will be alternative with and in addition to those in Practical Geometry, the candidate being allowed to choose some of them in place of questions in plane or solid Geometry. No marks will be given for Arithmetical or Algebraic solutions.

First Stage or Elementary Course.

Plane Geometry.

1. Construction of plain scales and scales of chords.
2. Problems relating to straight lines only.
   - *a.* To divide a given line in a given proportion.
   - *b.* To find the mean proportional and third proportional to two given lines.
   - *c.* To find the fourth proportional to three given lines.
3. Construction of a regular polygon of n sides on a given side.
4. Inscription of a regular polygon of n sides in a given circle.

* *This syllabus has been recast in the Elementary Stage.*

5. Reduction of given rectilinear figures to a triangle or square.
6. Construction of a three or four-sided figure of given area.
7. Construction of similar figures.
4. Miscellaneous simple problems relating to lines and circles.

Solid Geometry.

1. The principles of projection. Definition of terms in general use, such as projector, plan, elevation, section, trace, &c.
2. Simple problems relating to lines.
3. Simple problems relating to planes.
4. Plan and elevation of simple solids resting on the horizontal plane.
5. Plan and elevation of plane figures having given inclination of two sides or of plane and one side.
6. Plan and elevation of simple solids having one edge in the horizontal plane, and an adjacent face inclined at a given angle; or given the inclination of one face and one edge.
7. Sections of such solids by vertical and horizontal planes. In the elementary paper, given points or lines will be above the horizontal and in front of the vertical plane.

Graphic Arithmetic.

1. The representation of numbers by lines.
2. The multiplication of numbers by construction.
3. The division of numbers by construction.
4. The determination of the square root of numbers by construction.

Second Stage or Advanced Course.

Plane Geometry.

1. The construction of plain and diagonal "scales" to different linear units, English and foreign.
2. The division of a line in a given proportion, and in extreme and mean ratio. Construction for mean, third, and fourth proportionals, and for harmonic mean.
3. The construction of polygons from adequate conditions of sides, angles, area, or perimeter.
4. The constructions required in dealing with lines which intersect at points practically out of reach.
5. Miscellaneous problems relating to lines, circles, and plane figures.
6. The delineation of plane curves, such as the ellipse, parabola, hyperbola, cycloid, spirals, &c.
7. The construction of simple loci, both from geometrical and mechanical data, such as the practical setting out of curves described by particular parts of machines or link work.
8. The construction of curves from observed or tabular data, such as curves of varying pressure, temperature, resistance, and so forth, involving the elementary geometrical use of abscissa and ordinate.

Solid Geometry.

1. Miscellaneous problems relating to lines and planes.
2. Projections of the cube, prism, pyramid, tetrahedron, octohedron having given—
   a. A plane connected with the solid, and a line lying in that plane.
   b. Two lines connected with the solid.
   c. Two planes „ „ „ „
   d. The heights of three points of the solid.
3. Sections of the above solids by vertical, horizontal, and inclined planes.
4. Problems relating to the sphere, cone, and cylinder,—
   a. Representation of those solids in given positions and in contact.
   b. Determination of tangent planes to them.
   c. Determination of their sections by planes under given conditions.
   d. Intersection of their surfaces when variously combined or "interpenetration."
5. The screw, delineation of the simple helix. The square and V-threaded screw.
6. Simple cases of cast shadows, the rays of light being supposed parallel.
7. Principles and practice of isometric projection.

N.B.—The solid geometry problems may be worked either by means of projections on two co-ordinate planes, or by horizontal projection with figured indices, which will often simplify the constructions. Either mode of representation will be employed for the data of the questions, as may be most convenient.

Graphic Arithmetic and Statics.

1. Multiplication and division of numbers by lines.
2. Determine by construction lines representing the values of such expressions, as—

$$\sqrt{m} \quad \sqrt{\frac{m}{n}}, \quad \sqrt{\frac{1}{m}} \text{ &c.; } m \text{ and } n \text{ being given numbers.}$$

3. Representation of areas and volumes by lines.
4. Resolution of a given force in two directions.
5. Determination of the resultant of any number of forces acting at a point or parallel.
6. Graphic determination of the moment of a force, and of the resultant moment of several forces.

Examination for Honours.

Plane Geometry.

Miscellaneous problems relating to lines and circles. Construction of plane figures from different data. Construction from different data of the ellipse, parabola, hyperbola, their tangents and centres of curvature. Delineation of various curves which occur in the arts, or find place in the geometry of machines. Linkages. The cycloid and analogous curves, with their tangents, normals and centres of curvature. The evolute and involute of the circle and ellipse. The Archimedean and logarithmic spirals. Interpretation of loci from geometrical and mechanical data. Construction of curves obtained by observation, or given by self-recording instruments.

Solid Geometry.

Miscellaneous problems relating to lines and planes. Use of contours in determining the intersection of surfaces. Projection of solids in various

positions. Sections of solids and surfaces of various forms by planes. Intersection of curved surfaces and interpenetration of solids. Development of conical and cylindrical surfaces. Representation of helical and twisted surfaces. Tangent planes to surfaces of the second degree. Shadows cast by solids of various form on each other and on any plane, the rays of light being either parallel or convergent. Principles of isometric projection. Isometric projection of objects of various forms. Principles of map projection. Principles and practice of perspective.

Graphic Statics.

1. Representation of numbers, areas, and volumes by lines.
2. Composition and resolution of forces acting in any direction in a plane.
3. Graphic determination of centres of gravity moments of inertia, and radius of gyration of plane figures.
4. Determination of the resultant couple of a system of couples in one plane.
5. Curve of pressure in circular arches.
6. Construction of stress diagrams for simple braced structures variously loaded.

[N.B.—In the construction of stress diagrams, Students are strongly advised to adopt the notation used by von Ott & Clarke, indicating each bar of a braced structure and its corresponding reciprocal by the same number.]

Appendix to Syllabus of Subject I.

Teachers of Science Classes are strongly recommended to study the following brief outline of an elementary course of Descriptive Geometry, and to base their teaching upon it. The problems therein enumerated should be thoroughly mastered, as they illustrate important principles and involve constructions which are of constant occurrence. When a difficulty presents itself in realising the conditions of a problem, the student should be encouraged to extemporize a model by bending up stiff paper or card to represent the planes of projection, cutting out pieces of card or paper to represent planes in various positions, and using pencils, pieces of wire or thread to represent lines. By this means the habit of thinking out a question will be developed.

1. Represent (by its plan and elevation) a point in space in all possible positions with respect to the planes of projection (*i.e.*, above or below the horizontal plane, before or behind the vertical plane). Conversely given the projections of a point, state its position with respect to the planes of projection.
2. Given the plan and elevation of a line, with its extremities situated in given positions with regard to the co-ordinate planes, determine:—
   - *a*. The traces.
   - *b*. The true length, and inclination to each plane of projection. Conversely, draw the plan and elevation of a line of given length when inclined at $a°$ to the horizontal, and $b°$ to the vertical plane.
   - *c*. Obtain a new elevation of the line on any assigned ground line.
3. Assume two intersecting lines and determine the real angle they contain.
4. Draw the projection of a line which is parallel to a given line.
5. Represent by their traces planes in the following positions:—
   - *a*. At right angles to one plane of projection and inclined at a given angle to the other.
   - *b*. At right angles to both planes of projection.
   - *c*. Parallel to the ground line.
6. Given the traces of a plane in any position with respect to the planes of projection. Determine the inclination of the plane to both planes of projection and the real angle contained by the traces. Conversely, obtain the traces of a plane which makes given angles with the planes of projection.
7. Determine the intersection of two given planes and the real angle they contain. Conversely, determine the traces of a plane which makes a given angle with a given plane.
8. Determine a plane parallel to a given plane and (*a*) containing a given point; or (*b*), at a given distance from the given plane.

9. Determine the intersection of a given line and plane and the angle contained between them.

10. From a given point drop a perpendicular on a given plane. At a given point on a given plane erect a perpendicular of given length.

11. In a given plane place a horizontal line or a line having any given inclination. From a given point draw a line parallel to a given plane and inclined at a given angle.

12. Obtain the projections of any polygon, given the inclination of its plane and of a side, diagonal, or any line connected with it.

13. Determine a plane (*a*) to contain three given points, (*b*) to contain two lines including a given angle and inclined at given angles. Obtain the projections of any polygon, given the inclination of two adjacent sides, of a diagonal and adjacent sides, or generally of any two intersecting lines connected with the polygon.

14. Draw the plans of the cube, prism, pyramid, tetrahedron, octohedron (*a*) resting with one face on the horizontal plane (*b*) one edge in the horizontal plane and an adjacent face inclined at a given angle. Make elevations of these solids on different ground lines and sections by different vertical planes.

15. Given the plan and one elevation of any object of simple form make a new elevation, or a section on any given line.

SUBJECT II.—MACHINE CONSTRUCTION AND DRAWING.

This subject includes a knowledge of the form of the parts of machines, the physical characteristics of the materials used in machine construction, the various workshop processes employed in giving the materials the required shape and size, the magnitude of the straining actions to which they are exposed, and the methods of estimating the dimensions necessary to withstand those straining actions.

In addition to this knowledge the possession of which may be shown by means of written descriptions, freehand sketches and calculations, a candidate for examination in this subject will be required to be able to draw neatly, to scale, the whole or part of a machine either from dimensioned sketches, which are provided, or from his own design.

In the Elementary Stage.

A candidate will be required to draw in simple or orthographic projection neatly in pencil to a given scale, two or more views (sectional or outside), of a simple portion of a machine in common use. The sketches from which the drawings are to be produced will be given. They will in general be incomplete, and be drawn purposely somewhat out of proportion, and the candidate will be required to set off, correctly to scale, dimensions, some of which are given on the view he is drawing, the remainder being obtained from the other views. He will be expected to add parts which are omitted from some of the sketches, but shown in shape and size in others. He will further be expected to draw from his own knowledge the fastenings which are suitable for connecting together the machine parts which are the subject of the example, and, in sectional views, to draw lines neatly by freehand to indicate parts cut by the planes of section, taking care to slope the lines on all the parts of the same piece in the same direction, and of contiguous pieces in directions differing from one another.

In some simple cases an additional new view (outside or sectional), which is not shown in the sketches will be required to be drawn, and details which are shown in separate detached sketches will be required to be inserted in their proper places in the general drawing.

The various views required must be placed in position so as to project from one another in order to show that the candidate appreciates the fact that he is producing a representation of a solid piece of machinery and not merely copying a sketch. No credit whatever will be given unless the candidate shows some knowledge of projection by drawing two views of at least one subject in their proper relative situations.

Teachers are enjoined not to rely too much on drawings in giving instruction to their classes, but to make use also of actual simple machine parts or models of them.

It is desirable that centre lines should be shown distinctly, and the parts of other lines continued too far, and not needed in the finished drawing, should be rubbed out.

In order to save time during the examination the drawings should not be inked in, nor should the figured dimensions be inserted.

The following list of examples which have been set in previous years will give a general indication of what may be expected and prepared for :—

Parts of an Engine. — Piston. Piston rod end and guide block. Connecting rod. Crank shaft. Excentric and rod. Valve rod end. Simple form of loaded governors.

Parts of a Boiler.—Cusset stay. Mud hole door. Water gauge cock. Simple feed pump.

Portions of Machine Tools.—Fast headstock and spindle of a lathe. Rest for a hand-tool for a lathe. Jaw of a dog-chuck for a lathe. Quadrant for carrying change wheels for a lathe. Ram of a slotting machine. Parallel jaw vice.

Mill Work.—Footstep bearing for an upright shaft. Joint for segments of large spur wheel. Bearing for turbine shaft. Wall bracket.

General Fittings. — Hooke's coupling. Ball bearing for a tricycle. Hydraulic pipe joint. Union joint.

Besides making drawings, candidates will be required to answer some of a number of questions on machine construction, and illustrate those answers by sketches. Unless specially instructed to the contrary the sketches should be drawn freehand. The capability of making freehand sketches of parts of machines from memory is of the greatest value to an engineer, and when the sketches are drawn to a tolerable proportion they will be estimated by the examiners at at least as high a value as those drawn more accurately by means of instruments with a much larger expenditure of time.

The details of this portion of the subject may be classified as follows :—

Formation of Parts of Machines which are in Working Contact :—

Journals of Shafts and Bearings. — Constructions to facilitate adjustment for wear and renewal by cylindrical bushes, cones, and brasses, or steps with caps.

Methods of preventing end movement by groove and pin, by collars and by simple forms of footstep or pivot bearings. Joint pin. Knuckle joint. Methods of fixing pin rigidly to the fork portion of the joint.

Simple forms of lubricators.

Rubbing Surfaces of Sliding Pieces.—Method of adjustment for wear as in the slide rest of a lathe or other machine tool.

Helical or Screw Motion.—Construction of a helical curve. Meaning of the terms pitch and angle of thread.

Surfaces suitable for Rolling Contact.—Cylinders, frustums of cones and spheres.

Surfaces for a Combination of Rolling and Sliding Contact. Elementary information relative to the form of spur and bevil wheels.

Belt Gearing.—Advantage of a rounded surface. Methods of connecting the ends of a belt.

Constructions to permit of the Application of the Urging Force and the Working Resistance to the Moving Parts.—Simple forms of

pistons, plungers, and stuffing boxes. Use of leather in hydraulic work Simple forms of slide, lift, and screw down valves, and two-way turn cocks.

Methods of Construction to facilitate the Manufacture of Machine Parts :—

Connections, whereby parts more easily manufactured and more readily renewed when detached, are joined together more or less permanently and rigidly to compose one single piece of a machine. Use of chipping strips.

Riveted Joints.—Forms of rivets. Junction of plates by single and double riveting in chain and zig-zag with lap and butt joints. Use of angle, tee, and channel irons.

Bolted Joints.—Bolts with various forms of heads and nuts. Studs and screws. Use of washers. The Whitworth and square form of screw threads. Raised threads. Methods of preventing nuts from working loose. Prevention of bolts from turning when screwing up the nut. Forms of spanners.

Cotters.—Draw of cotter and clearance. Use of jib. Methods of preventing cotters from working loose.

Flanged Joints of pipes and cylinders. Methods of making them steam and water tight. Use of a centring ring in a cylinder cover. Union joint for small pipes. Socket joint.

Construction of the frame of a Machine.—Methods of securing frames to foundations. Simple forms of pedestals for supporting a shaft, and methods of attachment to the frame or to a bracket. Simple forms of brackets, hangers, and wall boxes.

Boilers.—Elementary knowledge of their construction. The methods of uniting the plates. The strengthening of a boiler by the use of bar and gusset stays.

Primary Pieces.—Connection of the parts of a shaft. Crank pin to crank arm and arm to shaft. Use of sunk, saddle, and feather keys. Methods of withdrawing keys. Box and flange couplings. Connection of the two parts of an excentric sheave, excentric radius, travel of valve. Connection of the parts of sliding pieces. Piston to rod. Rod to crosshead or guide-block, and slide valve to valve rod.

Secondary Pieces.—Parts of a connecting rod. Construction of an excentric strap and rod.

Physical Characteristics of the Common Materials used in Machine Construction.—Elementary information as to the relative strength, durability under wear, resistance to corrosion, and capability of being cast or forged of iron, steel, brass, and copper. Any question which may be set on the strength and proportions of machine parts will be only of a very elementary character.

Workshop Processes.—Elementary information of the processes by which the desired shape is given to machine parts, including the use of the lathe, the planing, shaping, slotting and drilling machines.

The Advanced Stage.

Will include all that has been detailed for the Elementary Stage.

The examples to be drawn to scale will be a piece of machinery of more complicated construction, requiring the candidate to possess more capability of reading drawings, and the greater part of the drawing required will consist of views not shown, but which will have to be deduced from information given in other views. A greater facility of execution will be expected to be shown by a larger quantity of drawing of a better finish than in the Elementary Stage.

The following is a list of examples which have been set in some previous years :—

Parts of an Engine.—Link reversing gear. Regulator valve. Hydraulic engine. Double-ported slide valve.

PARTS OF A BOILER.—Giffard's injector. Safety valve. Double acting pump.

MILL WORK.—Wall fixing with shafts and bevel wheels. Collar bearing for suspended vertical shaft. To answer the questions a more intimate and detailed knowledge of the parts of machines previously enumerated will be required, and of the following in addition :—

FORMATION OF PARTS OF MACHINES WHICH ARE IN WORKING CONTACT.

BEARINGS AND JOURNALS OF SHAFTS.—Methods of completely providing for wear in any direction. Bearings in which the direction of the centre line of the shaft is capable of automatic adjustment. Bearings for working under water; for very high speeds; for locomotive carriages Construction permitting the use of antifriction soft metal.

RUBBING SURFACES OF SLIDING PIECES.—Use of renewable slipper piece with the guide block of an engine. Automatic lubrication of slides. Guides or valve rods.

HELICAL OR SCREW MOTION.—Screw and nut for transmitting energy. Adjustment for wear of nut.

SURFACES SUITABLE FOR ROLLING CONTACT.—Methods of keeping in place live rollers used in cranes and heavy revolving pieces.

SURFACES FOR A COMBINATION OF ROLLING AND SLIDING CONTACT.—Simple forms of cams and ratchets. Formation of teeth of wheels. Mortice wheels.

BELT GEARING.—Fast and loose pulleys and strap fork arrangements. Length of belt. Rope pulleys. Gearing chains and pulleys.

CONSTRUCTIONS TO PERMIT OF THE APPLICATION OF THE URGING FORCE AND WORKING RESISTANCE TO THE MOVING PARTS.—Metallic gland packing. Hydraulic pistons. Pump buckets and valves. Mechanically controlled pump valves. Stop and throttle valves. Arrangements for relieving the pressure on slide valves. Expansion valves for steam engines.

METHODS OF CONSTRUCTION TO FACILITATE THE MANUFACTURE OF MACHINE PARTS.

RIVETED JOINTS.—Treble riveted joints. Arrangement where three or more plates overlap. Caulking. Joints in the bars. Connection of parts in girder work. Ordinary proportions of joints and simple calculations of strength.

BOLTED JOINTS.—Ordinary proportions of bolts and nuts and simple calculations of strength. Buttress form of screw thread. Foundation and wall bolts and washers. Double ended bolts.

COTTERS.—Ordinary proportions of steel and iron cotters.

FLANGED JOINTS of pipes and cylinders. Diameter and number of bolts, Joints in copper pipes. Expansion joint for steam pipes.

CONSTRUCTION OF THE FRAME OF A MACHINE IN PARTS.—Fixings. Hangers and brackets for carrying pedestals of shafts connected by bevel wheels. Engine beds.

BOILERS.—Use of bridge or girder stays for strengthening flat surfaces of boilers.

PRIMARY PIECES.—Ordinary proportions of keys. Simple forms of disengaging couplings and friction clutches. Methods of constructing fly-wheels, pulleys, and spur-wheels in parts.

SECONDARY PIECES.—Forms of section suitable for transmitting a tensile force and a thrust. Form of section suitable for a locomotive coupling rod.

PHYSICAL CHARACTERISTICS OF THE COMMON MATERIALS USED IN MACHINE CONSTRUCTION.—Simple questions will be set on the strength and proportions of elementary machine parts and of the pressures at surfaces in working contact.

WORKSHOP PROCESSES.— Use of the milling machine. Conditions suitable for its application.

In the Honours Stage.

The examination is twofold. A paper will be set which may include any question relating to the design, the method of construction, and the use of any machine. As the subject is large, and includes all the various branches of engineering practice, a considerable choice of questions is provided, the candidate being restricted to answering only a limited number. In general about half the questions will be set on the theoretical portion of the subject and will require a knowledge of how to apply the principles of Applied Mechanics in the calculations relating to machines. This part of the subject will apply equally to the machines employed in all branches of engineering. The other questions will require answers of a descriptive character involving an intimate knowledge of special machines.

Those candidates who answer the questions in this paper in a sufficiently satisfactory way will be permitted to enter for a practical examination which will be held at South Kensington about four weeks after the written examination. At the practical examination the candidate will be required to execute a drawing, or design a portion of some machine from given data. In this part of the examination the candidate will in general be allowed the free use of text and note books so that he may to a large extent be working under conditions similar to those which obtain in an engineer's drawing office.

Candidates must themselves provide drawing instruments and all necessary materials, except drawing paper and drawing boards, which will be supplied by the Department.

SUBJECT III.—BUILDING CONSTRUCTION.

A larger number of questions will be set in the examination papers for the Elementary and Advanced Stages than the candidates will be allowed to attempt, so that he will, to a certain extent, be able to show his knowledge in such branches as he may, from circumstances, have paid special attention to.

First Stage, or Elementary Course.

It is assumed that the student has already mastered the use of the following drawing instruments:—rulers, ordinary and parallel; ruling pen; compasses, with pen and pencil bow-sweeps, as well as the construction and use of simple scales, such as 1, 2, 3, or more feet to the inch, showing inches; or such as $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{5}{8}$, or other fraction of full size, or of any given scale or drawing: also the meaning of such terms as Plan, Elevation (front, back, or side), Section, Sectional Elevation.

He should understand the object of bond in brickwork, *i.e.*, English bond, Flemish bond, or English bond with Flemish facing, and how it is attained in walls up to three bricks thick in the following instances, viz., footings with offsets, angles of buildings, connexion of external and internal walls, window and door openings with reveals and square jambs, external gauged arches (camber, segmental, and semi-circular), internal discharging arches over lintels, and inverted arches.

He should know where to put wood bricks, or plugging, and their use; the construction and uses of brick corbeling, and the construction of trimmer arches in fire-places.

He should be able to give sections and elevations to scale of the following kinds of mason's work, viz., uncoursed and coursed rubble, block in course, and ashlar, with their bond, and the proper dimensions of the stones, as to height, width of bed, and length; and of the following dressings, viz., window sills, window and door jambs, plain window and door heads, door steps, string courses, quoins, copings, common cornices, blocking courses; and of the following methods of connecting stones, viz., by cramps, dowels, joggles, and lead plugs.

He should be able to show how to join timbers by halving, lapping, notching, cogging, scarfing, fishing, and mortice and tenon; as applied to wall plates, roof timbers, floors, ceilings, and partitions.

He should be able to draw, from given dimensions, couple, collar, and king-post roofs, showing the details of the framing and of the ironwork.

He should be able to draw, from given dimensions, single, double, and framed floors, with or without ceilings beneath them; showing modes of supporting, stiffening, and framing the timbers, trimming round hearths and wells of stairs; also floor coverings of boards or battens, rebated and filleted, ploughed and tongued, and laid folding, with straight or broken joints, beveled or square heading joints.

He should be able to draw in elevation, from given dimensions, a framed partition with door openings.

He should be able to draw in elevation, and give vertical and horizontal sections of solid door frames and window frames.

He should be able to describe, by drawings, beadings of different kinds, dovetailing, cross-grooving, rebating, plough-grooving, chamfering, rounded nosing, and housing.

He should be able to draw in elevation, and give vertical and horizontal sections of, the following doors, viz., ledged, ledged and braced, framed and braced, paneled, and the mode of putting them together, position of hinges and furniture; as well as to describe, by drawing, the following terms as applied to panelled doors, viz., square and flat, bead butt, bead flush, moulded, all on one or both sides.

He should be able to draw in elevation, and to give vertical and horizontal sections of the following window sashes and frames, viz., single or double hung sashes with square, bevelled, or moulded bars, and cased frames; casement sashes hung to solid frames, with method of hanging and securing in each case.

He should be able to show, in elevation and section, the lead-work connected with chimneys, ridges, hips, valleys, gutters, and lead-flats.

He should be able to give an elevation and section of the slating of a roof laid with duchess or countess slates on boards or battens.

He should be acquainted with the proper cross section for cast-iron beams for use in floor girders or bressummers, or as cantilevers; and be able to draw such a section in its right proportions from given dimensions of flanges.

He should be able to draw in elevation, from given dimensions and skeleton diagrams, ordinary iron roofs up to 40 feet span, showing the sections of different parts, and methods of connecting them.

Second Stage, or Advanced Course.

In addition to the subjects enumerated for the Elementary Course—in all of which questions of a more complicated nature may be set, combining work done by the different trades—the knowledge of the students will be tested under the following heads, viz.:—

1st. Freehand sketches explanatory of any details of construction, such as the joints of iron and wooden structures, and other parts requiring illustration on an enlarged scale. These sketches may be roughly drawn, provided they are clear and capable of being readily understood.

2nd. The nature of the stresses to which the different parts of simple structures are subjected, as follows:—

In the case of beams either fixed at one or both ends, or supported or continuous, the student should know which parts of the beam are in compression, and which in tension.

He should be acquainted with the best forms for struts, ties, and beams, such as floor joists, exposed to transverse stress.

He should know the difference in the strength of a girder carrying a given load at its centre, or uniformly distributed.

In the ordinary kinds of wooden or iron roof trusses, and framed structures of a similar description, he should be able to distinguish members in compression from those in tension.

He should be able, in the case of a concentrated or uniform load or any part of a beam supported at both ends, to ascertain the proportion of the load transmitted to each point of support.

3rd. The nature, application, and characteristic peculiarities of the following materials in ordinary use for building purposes, viz.:—

Bricks of different kinds in common use, York, Portland, Caen, and Bath stones (or stones of a similar description), granite, pure lime, hydraulic lime.

Portland and Roman cement, mortars, concretes, grout, asphalte, timber of different kinds in common use, cast and wrought iron, lead.

4th. Constructive details, as follows:—

The ordinary methods of timbering excavations, such as for foundations to walls, or for laying down sewers; the erection of bricklayer's and mason's scaffolding; the construction of travelers; the use of piles in foundations, hoop iron bond in brickwork, diagonal and herring-bone courses in ditto, damp-proof courses, bond timber in walls and the objections to it.

He should know how bricks are laid in hollow walls, window or door openings with splayed jambs, flues, chimneys, fireplaces, and arches up to about 20 feet span; how mortar joints are finished off, and the thickness usually allowed to them; why bricks and stones ought to be wetted before being laid.

He should be acquainted with the construction of brick ashlar walls, rubble ashlar walls, stone stairs, wooden stairs (both dog-legged and open newel), skylights, fire-proof floors (such as brick arches supported on rolled or cast-iron girders, Fox and Barrett's, and Dennett's patent concrete floors), circular and egg-shaped drains, roofs of iron or wood, for spans up to 60 feet; the fixing of architraves, linings and skirtings to walls, shutters to windows, lath, plaster, and battening to walls, roof coverings of tiles and zinc, slate ridges and hips.

Written answers will be required to some of the questions.

Examination for Honours.

The Candidate will be called upon to answer in writing—illustrated by sketches, either freehand or to scale, as directed—questions on all the subjects previously enumerated for the elementary and advanced Courses.

He must possess a more complete knowledge of building materials, their application, strength, and how to judge of their quality; and in the case of iron, of the processes of manufacture, and the points to be attended to in order to insure sound castings, and good riveting.

He must be able to solve simple problems in the theory of construction, and to determine the safe dimensions of iron or wooden beams subjected to dead loads.

In ordinary roof trusses and framed structures of a similar description, he must be able to trace the stresses, brought into action by the loads, from the points of application to the points of support, as well as to determine the nature and amount of the stresses on the different members of the truss, and consequently, the quantity of material required in each part.

In ordinary walls and retaining walls, he must be able to ascertain the conditions necessary to stability, neglecting the strength of the mortar.

Those candidates who answer the questions in the written paper in a sufficiently satisfactory way will be permitted to enter for a practical examination which will be held at South Kensington. This examination will be held on one day. The time allowed for work will be seven hours—three hours in the morning and four hours in the afternoon. Candidates will be required to design some small building or portion of a building, giving a plan, section, and elevation.

When candidates are directed to attend the examination they will be made acquainted with the nature of the building they will be called upon to design.

Candidates must themselves provide drawing instruments, T squares, and all other necessaries, except drawing paper and drawing boards, which will be supplied by the Department.

SUBJECT IV.—NAVAL ARCHITECTURE.

First Stage or Elementary Course.

Candidates for the first stage will be required to possess sufficient knowledge of practical shipbuilding to be able to describe the methods usually adopted by the workmen in forming and combining the several parts of a ship's hull; to be able to make sketches to scale; and to prepare the simpler calculations usually made in drawing offices, such as those relating to the areas of plane curves, &c.

The candidates will not be required to have a knowledge of all the systems of shipbuilding now practised, whether in (1) iron and steel, or (2) in wood and composite construction. A sufficient number of questions will therefore be set to enable a candidate to pass in either of these branches.

Second Stage or Advanced Course.

Candidates for the second stage will, in addition to that which is prescribed for the first stage, be required to answer questions relating to the strains to which ships are liable; the structural arrangements which give the strength required to resist these strains; the nature of the materials used in shipbuilding, and the tests to which these materials are subjected; also to possess a knowledge of laying off on the mould loft floor; and more advanced calculations, such as those for the centres of gravity of the areas of plane curves, and for strength of butt-fastenings in iron and steel ships, &c.

Examination for Honours.

The honours examination, in addition to what is prescribed for the preceding courses, will embrace questions relating to the higher calculations, such as those for displacement, centre of buoyancy, longitudinal and transverse metacentres, moment to change trim, strength to resist longitudinal bending, areas of wetted surface, &c.

Those candidates who answer the questions in the written paper in a sufficiently satisfactory way will be permitted to enter for a practical examination which will be held at South Kensington. This examination will be held on two consecutive days. The time allowed for work on each day will be seven hours.

Candidates will be required to make a sheer draught of a vessel from particulars to be furnished.

Candidates must themselves provide all drawing instruments, moulds, battens, straight edges, squares, &c., and all other necessaries, except drawing boards, drawing paper, and batten weights, which will be furnished by the Department.

Neatness and accuracy in drawing will be insisted on.

SUBJECT V.—MATHEMATICS.

This subject is divided into seven stages. The examination in stages 1, 2, and 3 is taken on one evening; in stages 4 and 5 on another; and in stages 6 and 7 on a third.

A student may in any one year come up on all three evenings, but he may only take up one stage on each evening.

Sufficient questions will always be given in the early portions of each stage to enable a student with a thorough knowledge of them by good answering to obtain a pass in the Elementary Stage or a second class in the Advanced Stage.

First Stage.

No candidate will be allowed to pass who fails to obtain marks in any one of the three sections of this stage.

1. Arithmetic.—The principles of arithmetical operations, and their application to simple questions. The fundamental rules applied to whole numbers and to vulgar and decimal fractions. Proportion. Extraction of the square and cube roots of numerical quantities. Arithmetic as applied to ordinary questions of commerce and trade, including such questions as arise out of Bills, Interest, Per-centages, Purchase and sale of stocks and shares. Division of profit and loss. Estimates. Weights and measures. The metrical system.

2. Geometry.—The properties of lines, triangles, and rectilinear figures, as far as they are treated in the 1st Book of Euclid.

The questions in this subject will generally be given so as to bring out as far as possible the candidate's knowledge of the principles of geometry. They will not, commonly, be set in the form of Euclid, but will consist as far as may be of definitions and easy geometrical theorems which can be proved, and problems which can be solved by the application of the well-known properties of triangles, &c. Any solution, whether in the words of Euclid or not, which shows that the candidate possesses an accurate method of geometrical reasoning will be accepted; but he should not use in his demonstrations any single angle greater than an obtuse angle. In other words, Euclid's limitation of the magnitude of an angle should be observed in Elementary Geometry. Candidates should endeavour to draw good figures, and should as much as possible keep the demonstration on the same page with the figure.

3. ALGEBRA.—Definitions and explanations of algebraical signs and terms. Numerical substitutions. Integral indices. Addition, subtraction, multiplication, and division of algebraical expressions and fractions. Factors, greatest common measure and least common multiple. Reduction of fractional expressions. Simple equations and problems producing them.

SECOND STAGE.

No candidate will be allowed to pass who fails to obtain marks in any one of the three sections of this stage.

All the preceding subjects, with these additions :—

1. GEOMETRY.—The properties of rectangles and circles, as far as they are treated in the 2nd and 3rd books of Euclid.

   The remarks under the head of geometry in the first stage are applicable to the second stage. Answers to questions may be given on any system which the student may have followed, provided the reasoning be clear and accurate.

2. ALGEBRA.—Involution and evolution. Surds. Quadratic equations, and problems producing them. Ratio. Proportion.

3. PLANE TRIGONOMETRY.—Definitions. Measurement of angles by degrees or grades; the circular measure of an angle. The trigonometrical functions, and the conversion of one into another. Use of the positive and negative signs to denote contrariety of direction. Tracing of the trigonometrical functions in magnitude and algebraic sign through the four quadrants. The arithmetical values of the trigonometrical functions of 30°, 45°, 60°, 75°, 90°, &c.

   LOGARITHMS.—Definition. Multiplication, Division, Involution and Evolution by logarithms. The use of tables of logarithms of numbers, and of sines, cosines, &c. of angles. Tables of proportional parts for numbers and angles.

   TRIANGLES.—Solution of all cases of right angled and oblique triangles, and proofs of the requisite formulæ. Heights and distances. Area of a triangle.

THIRD STAGE.

All the preceding subjects, with these additions :—

1. ALGEBRA.—Permutations and Combinations. Progressions. Complete theory of indices. The Binomial theorem with any index.

2. PLANE TRIGONOMETRY.

   Formulæ for finding the sine, cosine, &c. of the sum and difference of two angles, and of the multiples and submultiples of an angle. Diameters of circles inscribed in and circumscribed about a given triangle. Areas of regular polygons inscribed in and circumscribed about a given circle. Area of a circle. Description and use of the vernier and of the theodolite and sextant.

A student may, in place of the preceding trigonometry, take up the elements of spherical trigonometry. Questions will be given in both subjects, but in this stage plane trigonometry and spherical trigonometry are alternative subjects; questions may be answered in either, but not in both.

3. SPHERICAL TRIGONOMETRY.

Definitions and elementary properties of great and small circles; also of a spherical triangle and its sides and angles. Relations between the angles and sides of supplemental triangles. The fundamental relations between the trigonometrical ratios of the angles and sides of every spherical triangle. Solution of right-angled, quadrantal, and other spherical triangles. The analogies of Napier and the formulæ of Gauss.

HONOURS.

Candidates for Honours will be expected to show a sound as well as more advanced knowledge of the subjects of the preceding stages. They will be examined on some or all of the following points.

In ALGEBRA:—Examples involving somewhat difficult transformations. The binomial theorem and the exponential and logarithmic series. The simpler tests of the convergence and divergence of series. Simple cases of the summation of series. Method of indeterminate co-efficients. Continued fractions. Elementary properties of numbers. In GEOMETRY:—Problems in pure geometry, and problems requiring the aid of algebra or trigonometry for their complete solution. In TRIGONOMETRY:—Examples to test the familiarity of the student with the principles of the subject. Angles greater than two right angles. Relations bteween trigonometrical ratios and all the angles they indicate. Trigonometrical eliminations and transformations. Demoivre's theorem for an integral positive index. The exponential expressions for the sine, cosine, and tangent of an angle, and the resulting series. Trigonometrical series and expansions. Proportional parts. Calculation of the logarithms of the trigonometrical ratios by series. Advanced questions will likewise be set in spherical trigonometry.

FOURTH STAGE.

PLANE GEOMETRY.—Ratio and proportion. The similitude of figures. Proportional division of straight lines. The inscription of regular polygons in circles.

N.B.—A knowledge of the 4th and 6th Books of Euclid's Elements, supplemented by clear notions of the ratio and proportionality of incommensurable, as well as of commensurable magnitudes, will suffice. Correct demonstrations, however, derived from any other source will be accepted.

SOLID GEOMETRY.—The properties of straight lines and planes; their intersections, inclinations, parallelism, perpendicularity, &c.

Trihedral and polyhedral angles. Prisms and pyramids; their definitions, plane sections, similitude, &c.; their quadrature and cubature.

Elementary properties of the sphere, and of cylinders and cones with circular bases; their plane sections, tangent planes, surfaces, and volumes.

*DESCRIPTIVE GEOMETRY.—Representation of points, straight lines, and planes, by projections and traces on two orthogonal planes. The use of auxiliary projections and rabatments. Graphic solutions of problems concerning straight lines and planes; their intersections, inclinations, &c. Problems on trihedral angles.

GEOMETRICAL CONICS.—Properties of the parabola, ellipse, and hyperbola deduced by pure geometry from definitions *in plano*.

Fifth Stage.

The preceding subjects of the fourth stage, together with the following:—

*Descriptive Geometry.—Problems concerning spheres, cylinders, cones, and simpler surfaces of revolution; their intersections by straight lines, by planes, and by one another; their tangent planes and normals, &c.

Spherical Trigonometry.—Definitions. Great and small circles. Angles and sides of spherical triangles. Relations between the angles and sides of supplemental triangles. The fundamental relations between the trigonometrical ratios of the angles and sides of every spherical triangle. Solution of right-angled, quadrantal, and other spherical triangles. The radii of their in- and circumscribed circles. The analogies of Napier and the formulæ of Gauss.

Co-ordinate Geometry.—Rectangular, oblique, and polar co-ordinates of a point, and transformations from one system of such co-ordinates to another.

Equations of straight lines, and the treatment of questions relative to their intersection, concurrence, inclination, parallelism, perpendicularity, &c.

Equations of circles, their tangents, and normals. Elementary properties of poles and polars relative to the circle. Questions concerning the intersection of circles, and the determination of circles which satisfy given conditions.

The simpler forms of the equations of the parabola, ellipse, and hyperbola, as determined from various definitions of those curves. The equations of their tangents and normals. The principal properties of their diameters, axes, foci, conjugate diameters, asymptotes, poles, and polars.

Discussion of the general equation of the second degree referred to oblique or to rectangular co-ordinate axes.

Co-ordinate Geometry of three Dimensions.—Co-ordinates of a point referred to oblique or to rectangular co-ordinate axes. Direction angles of straight lines. Inclination of two straight lines. Locus of points whose co-ordinates satisfy a given equation, or two given equations. Equations of planes and of straight lines. Determination of their inclinations, and of the conditions of their parallelism and perpendicularity. Treatment of questions concerning straight lines and planes.

Honours.

Candidates for honours will be expected to show some knowledge of the modern methods both of pure and of co-ordinate geometry, including the use of abridged methods of notation, of homogeneous point co-ordinates and line-co-ordinates, and of the modes of investigating thereby some of the simpler properties and singularities of higher plane curves.

In co-ordinate geometry of three dimensions, a knowledge of the classification and fundamental properties of surfaces of the second order will be demanded.

Sixth Stage.

Differential Calculus.—Definitions. Limits. Differential coefficients. Differentiation of simple functions, of inverse functions. Successive differentiation of functions of one variable. Taylor's and Maclaurin's Theorems and their simpler applications. Determination of values of functions when indeterminate in form. Differentiation of a function of a function and of implicit functions. Maxima and minima of functions of one independent variable.

* Though some knowledge of descriptive geometry is desirable for candidates in this stage it is not indispensable. A sufficient number of questions will be given in the remaining subjects of examination to enable a thoroughly prepared candidate to obtain the maximum number of marks independently of descriptive geometry.

Applications of the preceding to the geometry of plane curves referred to rectangular or to polar co-ordinates. Tangents, normals, sub-tangents, sub-normals, asymptotes. Multiple and singular points. Contact and curvature. Tracing of curves. Differential coefficients of arcs and areas of plane curves, and of the surfaces and volumes of solids of revolution.

INTEGRAL CALCULUS.—Meaning of definite and indefinite integration. Integration of the more frequently occurring functions. Integration by parts. Rational fractions. Formulæ of reduction.

Applications to the rectification and quadrature of plane curves referred to rectangular and polar co-ordinates, as well as to the quadrature of surfaces of revolution.

SEVENTH STAGE.

DIFFERENTIAL CALCULUS.—In addition to the subjects of the sixth stage the following:—Differentiation of functions of two or more independent variables. Lagrange's and Laplace's Theorems. Change of independent variables. Expansion of functions of more than one independent variable. Maxima and minima of such functions. Elimination of functions.

Geometrical applications of the calculus. Involutes and evolutes of plane curves. Envelopes of curves and surfaces. Tangent planes and normals to surfaces. Tangents and normal planes to curves of double curvature. Differential coefficients of the arcs of such curves, as well as of the surfaces and volumes of solids.

INTEGRAL CALCULUS.—Double and triple integrals. Applications of the calculus to the quadrature of curved surfaces and the cubature of solids. Change of variables in a multiple integral. Definite integrals; their differentiation and simpler properties.

DIFFERENTIAL EQUATIONS.—Their nature, origin, and classification. Integrable forms of differential equations of first order and degree. Integrating factors. The methods of integrating differential equations of first order, but not of first degree. Linear differential equations. Integration of them by symbolical methods when the coefficients are constant. Singular solutions of differential equations. Ordinary differential equations with more than two variables. Simultaneous differential equations. The nature and origin of partial differential equations. Integration of the simpler forms.

CALCULUS OF FINITE DIFFERENCES.—Nature and object of the calculus. Definitions of its symbols and terminology. Differences of elementary functions. Relations between successive values and differences. Differences of zero. Meaning of integration. Easy applications of the calculus to interpolation and the summation of series.

HONOURS.

In the examinations for Honours, the range of subjects will be almost the same; but the questions proposed will be of a higher order of difficulty. A knowledge of the applications of the calculus to the theory of surfaces, and of the Elementary part of the Calculus of Variations will also be demanded.

SUBJECT VI.—THEORETICAL MECHANICS.

There are two distinct nomenclatures applicable to subject VI. According to one, the science that investigates the action of force is called mechanics, and is divided into (*a*) statics, treating of the equilibrium of particles and bodies, (*b*) dynamics, treating of the motion of particles and bodies, (*c*) hydrostatics, (*d*) hydrodynamics, treating respectively of the rest and motion of fluids, *i.e.* liquids and gases. This nomenclature is adopted by many writers of authority, *e.g.* by Poisson. According to the other, the term dynamics takes the place of mechanics, and the division is into: (i) statics, (ii) kinetics, (iii) hydrostatics, (iv) hydrokinetics. This is a question of words only, but of course one terminology may be better than another. It is, however, to be observed that a considerable number of questions, formerly treated under the head of (*b*) dynamics, relate to motion without reference to the forces producing it. These questions form a distinct branch of pure mathematics to which the name of kinematics is now commonly given. Certain parts of kinematics come into Subject VI., but they occupy a subordinate position in it.

Subject VI. can be taken in two divisions, the first corresponding to (*a*) and (*b*) defined above, the second corresponding with modifications to (*c*) and (*d*). In most cases it would be best for students to take up the first stage, or even first and second stages of the first division, before attempting the second division. However, students have their choice, and to enable them to take up the second division as a separate subject, the syllabus contains several articles which also come into the first division.

In each division there is a first stage, second stage, and honour stage. The distinction between the stages is much the same in the two divisions.

In the First Stage the student is required to make himself acquainted with the axioms and the elementary propositions and formulæ of the science, as simple matters of fact, independently of their formal proof. For instance, he must know the proposition called the parallelogram of forces, as a matter of fact, and must be able to apply his knowledge; but he will not be required to prove the proposition. In like manner he will be required to know what is the metacentre of a floating body, but not to prove the formula for finding its position. In a word, he will be required to make brief exact statements, and to work out easy examples. With perhaps an occasional exception, the examples will be either arithmetical, or capable of being answered by an easy construction drawn to scale. No question involving complicated algebra or geometry will be set. The student should be able to substitute numerical values in an algebraical formula, and to solve a simple equation. He should also have accurate notions of ratios. Every student should bring to the examination a pair of compasses, a scale of equal parts, and a protractor.

In the Second Stage of either course the student will be concerned with the mathematical treatment of the principles which form the subject of the first stages respectively, so far as the subject can be discussed with the aid of what is generally called elementary mathematics. He should pay particular attention to the proofs of the mechanical propositions referred to in the synopsis of the courses. Thus, he should not merely know that when a particle moves in a circle the force acting towards the centre is given by the formula $mv^2 \div r$, but he should be able to state the reasoning by which the fact is proved, and to apply his knowledge to a moderately hard example. He should not merely know the rule for finding the magnitude of the resultant pressure of a liquid on a plane area, but be able to state the proof of it.

In the Honours Stage of either course it will be assumed that the student has a fair knowledge of what is commonly understood by the higher mathematics, though in drawing up the questions it will be endeavoured to exclude those which have a merely geometrical or algebraical interest.

It is of course understood that in any stage of either division any question may be asked, which fairly arises out of the contents of any previous stage. It may be added that in all stages the student should bring to the examination the drawing instruments that are necessary for the first stage.

DIVISION I.

First Stage or Elementary Course.

1. Units of time and distance; measurement of velocity, whether constant or variable; measurement of acceleration, particularly of constant acceleration; acceleration due to gravity; mass or quantity of matter, unit of mass, density, specific gravity (or specific density); momentum; measurement of force; absolute units of force, particularly the poundal or British absolute unit; distinction between the mass and the weight of a body.

2. Specification of a force. Composition of forces, particularly of two forces, whether acting along intersecting or parallel lines. Equilibrium of two or three forces. Statical couples. Moment of a force. Centre of parallel forces. Work done by a force. Units of work, foot-pound, units of power, horse-power.

3. Different states of matter. Elasticity. Resistance to (1) elongation, (2) compression, (3) bending and (4) torsion.

4. Centre of gravity, and its position in simple cases. Reaction of smooth surfaces, points, and hinges. Equilibrium of a body capable of turning on a fixed point or fulcrum. Levers; the steelyard; the balance and its sensibility. Tension of a thread. Pulleys. Equilibrium of a body resting on a smooth plane, horizontal or inclined. Stable and unstable equilibrium.

5. Laws of uniformly accelerated motion, and the formulæ embodying them, viz., $v=V+ft$, $s=Vt+\frac{1}{2}ft^2$, $v^2=V^2+2fs$. Atwood's machine.

6. Composition of two velocities. Uniform motion in a circle; centrifugal force. Small oscillations of a simple pendulum; and of a compound pendulum. Convertibility of the centres of oscillation and suspension. Determination of the numerical value of the acceleration due to gravity. Force exerted by the earth on the same mass at different places.

7. Definition of energy. Distinction between potential and kinetic energy. Absolute units of work, particularly the foot-poundal. Equation of work and energy for a constant force acting on a particle.

Second Stage or Advanced Course.

1. Relative rest and motion. Composition of velocities. Determination of the velocity of a moving point, relatively to another moving point. Angular velocity.

2. Newton's three laws of motion, and his proof of the parallelogram of forces.

3. The composition of forces—including parallel forces and couples—acting in one plane, and the conditions of their equilibrium. Centre of parallel forces.

4. Determination of the centre of gravity in ordinary cases. Properties of the centre of gravity.

5. Friction and laws of friction; co-efficient and angle of friction.

6. Equilibrium of simple machines when friction is not, and when it is, taken into account. Inclined plane, wedge, screw, pulleys. Equilibrium of body resting on axle, whether smooth or rough.

7. Virtual velocities (or virtual work). Stable and unstable equilibrium.

8. Work done by a variable force; diagrams of work in simple cases; the indicator diagram.

9. Rectilinear motion under the action of constant forces, particularly on smooth or rough inclined planes.

10. Motion of projectiles; motion in a circle; motion of a simple pendulum.

11. Impulsive forces. Direct and oblique impact of smooth spheres.

Honours Stage.

Owing to the great extent of the science of theoretical mechanics, it may be of use to the student to have those parts of the subject marked out to

which his attention should, in the first place, be directed. It cannot be too strongly urged on him that the study of the higher branches of mechanics cannot be attempted with advantage unless it is preceded by a thorough knowledge of the elements of the science. The candidate for honours should therefore be prepared to answer readily any question on the advanced course. Supposing this degree of proficiency obtained, his attention should next be directed to the subjects named below, or some of them.

It may be added that there will always be a sufficient number of questions arising out of Nos. 1, 6, 8 of the following articles, and out of Stages 1 and 2 to enable a student to obtain a second class with sound knowledge of these parts of the subjects.

1. The general theory of the composition and resolution of forces, and of the equilibrium of a rigid body. Centre of gravity.
2. Virtual velocities (or virtual work).
3. The equilibrium of flexible, inextensible threads.
4. Simpler cases of the deflection and rupture of beams.
5. The elements of uniplanar kinematics.
6. Moments and products of inertia.
7. General differential equations of the motion of a particle and of a rigid body.
8. Constrained motion of a particle; motion of a rigid body about a fixed axis, including the case when the forces are impulsive.
9. Motion in space of two dimensions.
10. The general principles of dynamics.

DIVISION II.

First Stage or Elementary Course.

The subject of Division II. cannot be understood unless the student has a preliminary acquaintance with the fundamental notions of force and motion, on which all parts of the science are based. These are given in Section 1 of the following syllabus. He should also understand what is meant by the resultant of two or more forces, and that in the case of two or more parallel forces the resultant equals the sum of the forces. He should know what is meant by the centre of gravity of a body, some of its elementary properties, and its position in the case of such bodies as sphere, prism, cylinder, circle, parallelogram.

1. Units of time and distance; measurement of velocity, whether constant or variable; measurement of acceleration, particularly of constant acceleration; acceleration due to gravity; mass or quantity of matter, unit of mass, density, specific gravity (or specific density); momentum; measurement of force; absolute units of force, particularly the poundal or British absolute unit; distinction between the mass and the weight of a body.

2. Definition of energy; distinction between potential and kinetic energy; the work done by a force; absolute units of work, particularly the foot-poundal; equation of work and energy for a constant force acting on a particle.

3. Definition of fluid and liquid; transmission of pressure through a fluid; measurement of pressure at any point of a fluid; surface of a liquid acted on by gravity, and pressure at any point within the liquid; distinction between the whole pressure and the resultant pressure of a liquid on a given surface; magnitude and line of action of resultant pressure in the case of a rectangular area, one edge of which is on the surface of the liquid; also in the case of a body wholly or partly immersed in a liquid.

4. Conditions of equilibrium of a floating body; definition of the metacentre; position of a metacentre in the case of a sphere, and of a cylinder with its axis vertical (the formula $4\ \mathrm{HM} \cdot hs = r^2$ being assumed); stability of floatation.

5. Determination of the specific gravity of insoluble solids, and of liquids (1) by the balance, (2) by the specific gravity bottle, (3) by Nicholson's hydrometer; specific gravity of solids lighter than water by the balance; weight of a body in air and in vacuo.

6. Distinction between heat and temperature; definition of higher and lower temperature, and of equal temperature; the mercurial thermometer,

and its graduation; Fahrenheit's, the centigrade and Réaumur's scales. Definition of absolute zero.

7. Air is a heavy elastic fluid; the barometer; pressure of air on the sides of a vessel containing it; variations in this pressure consequent on change of volume and temperature, *i.e.*, Boyle's Law and Dalton's Law, and the formula in which they are embodied, viz., VP=CT; limitation of Boyle's law; contents of the "vacuum-space" in barometers of different liquids.

8. Hydrometer of variable immersion; suction-pump; force-pump; siphon; air-pump and mercurial gauge; compressed air manometer; hydraulic press.

Second Stage or Advanced Course.

The demonstrations and additional subjects of the second stage require corresponding extensions in the preliminary part of the course, as mentioned below. But besides this the student should extend his knowledge of the centre of gravity, and learn how to find the moment of inertia in such simple cases as involve no more than finding the limiting value of $\Sigma_b^a (x^n \Delta x)$ by integration or otherwise, including the case in which $n = -1$.

1. Composition and resolution of forces acting on a body, and the general conditions of their equilibrium. Angular velocity. Uniform circular motion. Work done by a variable force.

2. Resultant pressure of a liquid on an immersed surface plane or curved. Centre of pressure in simple cases. Equilibrium of bodies floating freely or partly supported. Metacentre in simple cases (the formula $HM \cdot V = Ak^2$ being assumed). Tension of thin flexible cylinder or sphere under internal fluid pressure.

3. Pressure and elasticity of air; height of the homogeneous atmosphere; variations of the height due to variations of gravity and temperature; pressure of mixed gases; vapours in contact with the liquid producing them; saturation; the dew point; densities of dry and moist air. Work of gas expanding at a constant temperature.

4. Elementary notions of surface tension; rise of a liquid between two plates, and in a capillary tube.

5. Surface of a liquid in a vessel rotating steadily, under the action of gravity; pressure at any point of the liquid.

6. Velocity of liquid issuing from hole in the side of a vessel (Torricelli's Theorem); velocity of the descending surface of the fluid.

7. Elementary notions of the propagation of an aerial disturbance along a straight tube; geometrical representation of the motion of the aerial particles constituting a wave; explanation of the interference of two waves; corresponding representation and explanation by means of a sine function (*e.g.*, $A \sin(nt + \beta)$).

Honours Stage.

The parts of this course are to some extent alternative. The student will be at liberty to answer questions in any part of the paper, but it will be possible for him to obtain a first class by answering questions arising out of previous stages, and out of the first six or out of the last four of the following articles. The honours stage consists in great part of the subjects of the previous stages, but treated more generally.

1. General conditions of the equilibrium of fluids acted on by any forces.
2. Resultant pressure of a liquid on plane and curved surfaces.
3. Centre of pressure of a plane area.
4. Condition of stability of floatation in respect of small displacements.
5. Stability of floatation when the displacement is large.

6. Formula for finding distances of altitude by the barometer and the necessary corrections.

7. Sudden compression and expansion of gases; ratio of specific heat of air at constant pressure to specific heat of air at constant volume.

8. Motion of aerial waves in a straight tube; investigation and integration of the equation $\frac{d^2 z}{dt^2} = a^2 \frac{d^2 z}{dx^2}$, and interpretation of results.

9. Elements of the kinetic theory of gases.

SUBJECT VII.—APPLIED MECHANICS.

In order to prepare for this examination the student should carefully inform himself as to the details and construction of the various contrivances, machines, and appliances, referred to in the list given below; and in doing so, he must seek to understand the manner in which certain natural laws or mechanical principles receive their useful application.

The list for the first stage is necessarily comprehensive, but the questions will be framed in such a manner that a candidate who has obtained a fair knowledge of a portion only of the subjects may hope to pass with some credit. Easy questions involving arithmetical results may arise, and in particular the student should be able to solve simple mechanical problems by graphic construction. The list for the second stage refers also to a wide range of subjects, and he will be liable to questions involving only a very limited knowledge of mathematics.

In the honours paper a fair amount of mathematical knowledge may be required.

First Stage or Elementary Course.

The subjects for examination will be:—

Measurement.—Line and end measure. Rules, callipers, gauges.

True plane Surfaces.—Surface plates. Method of surfacing. Applications in machinery.

The principle of Work and its application to simple Machines.—Levers. Balances. Safety valves. Pulleys. The snatchblock. Sheaves. The inclined plane. Screws, forms of thread, mechanical characteristics of screw threads. Right and left handed screws, single and double threaded screws. The screw and lever in combination. Screw presses. Lifting jacks. Endless screw and worm wheel. Wheel and axle, its applications. Winch or crab. Power gained by wheelwork.

The Conversion of Motion.—Endless bands, straps, fast and loose pulleys, guide pulleys. Toothed wheels. Rack and pinion. The crank and connecting rod. Cams. Mangle motions. Ratchet wheels, detents.

Special Contrivances.—Such as:—The fusee. The wheel and compound axle. Weston's pulley block. Escapements. Geneva stop. Fast and slow motion in the head stock of a lathe.

Energy.—What it means. The measure of work stored up in a raised weight or in a heavy mass in motion. The fly wheel. Fly presses.

The Pressure of Water.—Estimation of water pressure on plane surfaces, such as sluice gates. Pressure gauges. The hydrostatic press. The accumulator, or vessel for obtaining a supply of water under pressure.

MACHINES FOR RAISING WATER.—Pumps. Lift pumps. Force pumps. The use of an air vessel.

MATERIALS.—Iron; qualities required for different purposes. Testing of iron for strength and ductility. Steel; hardening and tempering. Copper and tin; their alloys. Gunmetal. Brass.

STRENGTH OF MATERIALS.—Power of resistance of different materials to tensile and compressive stresses. Power of resistance to forces acting transversely. Influence of form or dimensions of section. Influence of length, of position of load, of distribution of load.

FRICTION.—The laws of friction. Contrivances for lessening the effect of friction.

In answering the questions, students will be required to make hand sketches of the details of the various parts in a clear and intelligible manner. Great importance will be attached to this requirement.

SECOND STAGE OR ADVANCED COURSE.

The subjects for examination will include everything mentioned in the first course, but candidates will be expected to possess a more extended and thorough knowledge of the various details, as well as of theoretical principles. The additional matter will be the following:—

MISCELLANEOUS DETAILS.—The forging of iron. Welding. The casting of iron. Moulding. Soldering. Brazing. The expansion and contraction of metals.

FRICTION.—Examples where friction is useful. Rolling friction. Brakes. Strap-brakes. Friction, and other dynamometers. The efficiency of machines Friction grips. Holding power of ropes when coiled. Friction clutches.

STRENGTH OF MATERIALS.—Estimation of stresses in a rectangular timber beam. Cast and wrought iron girders. Cantilevers. Buckled plates. The deflection of beams.

STRESSES IN FRAMEWORK.—Simple examples of framework, with corresponding diagrams of stress. Travellers, roofs. Lattice girders. Trussed beams.

SHEARING STRESSES.—Cotters, rivets, joints of plates. Strength of shafting to resist torsion. Hollow or solid shafting.

COMPRESSIVE STRESS.—Pillars. Piers. T and angle iron struts. Tie bars.

THE CONVERSION OF MOTION.—Quick return movements. Linkwork and parallel motions. Peaucellier's invention. Trains of wheels for screw-cutting, clockwork. Epicyclic trains. Rope-making machinery. Differential motion of three bevil wheels. Universal joints.

PRESSURE OF AIR.—Fans, blowers. Air pumps. Gauges for measuring the pressure of air. Construction and efficiency of wind-mills. The diving bell.

HYDRAULIC MACHINES.—Water wheels. Forms of buckets. Pendulum Governor for water wheels. Turbines. Centrifugal pumps. Hydraulic press. The hydraulic jack. Hydraulic cranes, different powers. Force pump for feeding the accumulator. The water ram.

DESCRIPTION OF MACHINES IN COMMON USE.—Such as:—Cranes. Machines for weighing. Counting and numbering machines. Corn mills. Clocks. Dead beat escapement. The lever escapement. The chronometer escapement. The keyless watch. Hand-printing presses.

PRINCIPLES AND CONSTRUCTION OF HAND TOOLS.—Such as:—Chisels Planes. Gimlets. Augurs. Saws. Drills. Files.

MACHINE TOOLS.—Such as:—Lathes, ordinary and screw cutting. Planing, shaping, and slotting machines. Reversing motions. Drilling and boring machines. Punching and shearing machines. Feed motions.

The observations already made with reference to hand sketching apply equally here, and details of machines, such as feed motions, reversing motions, &c., might form the subject of questions, the answers to which will be of no value unless the sketches are correctly given.

Honours.

The above syllabus will sufficiently indicate the nature of the subjects that form the basis for the examination in honours. Candidates must be versed in mechanical principles, and will be asked to give theoretical investigations which may bear upon the subject matter under consideration.

ELEMENTARY PHYSICS.

An Alternative for the First or Elementary Stage of Subjects VIII. and IX.

The following is an alternative syllabus for Stage I. of Science Subjects VIII. and IX., and is intended for those students who do not propose to continue their studies further in these branches of Science, but to whom an elementary knowledge of Physics is necessary to enable them to pursue their studies in other subjects with advantage.

A pass in Elementary Physics will be registered as a pass in the Elementary stages of both Subjects VIII. and IX., and no second payment will be made on account of a pass in either subject at a future examination.

A paper will be set in this syllabus at the examination on the 7th May 1896, and a candidate may on that date take either it or the paper in the ordinary elementary syllabus of Subject IX.; but no candidate may be examined in the syllabus of the ordinary elementary stage of Subject IX., or of Subject VIII. on the 8th May, and also in this alternative syllabus.

All the experiments given in the list, except thus between square brackets [ ], must be shown to the class, and candidates will be expected to show a knowledge of the subject such as might reasonably be expected from those who had attended a course illustrated in accordance with the suggestions of this syllabus. The experiments described between square brackets [ ] will be found useful where the necessary apparatus can be provided.

SOUND.

Cause of Sound.

Sound produced by vibration. (1.)

Illustration.

1. Exhibit vibrating tuning fork and string.

Propagation of Sound.

Sound transmitted through solids, liquids, and gases. Study more particularly air. (2, 3.)

Air particles have only vibratory motions. (4.)
Sound wave consists of alternate compressions and rarefactions. (5, 6, 7.)
Wave length. Amplitude of vibration.

Experiments and Illustrations.

2. Strike a tuning fork and hold its root on one end of a deal rod, and place a board on and off the other end. This will show that the sound travels along the rod.

[3. A glass tube about 18 in. long and ½ in. wide, closed at one end, is fastened perpendicularly by wax to a square thin deal board (not cracked), about 2 ft. square. Support the board on three corks. Fill tube with water. Strike fork armed with cork cone, and plunge cone into water at top of tube. The sound heard shows the wave travels through the water.]

4. Show that water waves do not carry floating matter with them.

[5. Arrange "solitaire" balls or marbles in a groove, and hit the row with one, two, or three, noticing the number which are sent off from the other end.]

[6. Coil a long steel wire into a helix about 4 in. in diameter and 6 ft. long when the coils are about one-third of an inch apart. Suspend from two parallel wooden rods, every tenth or twelfth coil being hooked to two threads, one of which is attached to each rod so that the whole helix is horizontal and parallel to the rods. Gather a few coils at one end into the hand, and on releasing them observe the compression travel to the other end of the wire.]

7. Fasten one end of a caoutchouc tube about ¼ in. wide and 12 ft. long, and filled with sand, to the ceiling. Fasten a piece of paper near the top. Send a wave of rarefaction up the tube by quickly pulling the free end.

Velocity of Sound in Air.

Velocity greater in warm than in cold air.
High and low notes travel with the same velocity.

Reflection of Sound Waves.

Angles of incidence and reflection equal. (8, 9.)
Echoes. Whispering galleries.
Speaking trumpet.

Experiments and Illustrations.

8. Two tinned iron tubes, each about 3 ft. long and 4 in. in diameter, are fitted end to end. A watch is placed at such a distance from the ear as to be inaudible. The tube is placed over the ear and directed towards the watch. The ticking becomes audible.

9. The tubes are supported horizontally at an angle of 90° with one another. A watch is placed at the end of one, and the ear at the end of the other (the ends furthest apart), and screens are placed between the ear and the watch till the latter becomes inaudible. A piece of cardboard or the hand or a flat flame is placed at their contiguous ends, making 45° with each tube. This makes the watch audible and proves the law of reflection.

[This experiment may be better demonstrated if the watch is replaced by a small reed blown by compressed air, and the ear by a sensitive flame.]

Cause of Differences of Loudness and Pitch in Two Musical Notes.

The pitch of the note rises through an octave when the number of vibrations is doubled. (10.)

Transverse vibrations of strings.

The note rises when a string is shortened or stretched more tightly than before. (11, 12, 13, 14.)

Experiments and Illustrations.

10. A large humming top with a smooth button driven into its peg is filled with sand and closed. Resting upon the body of the top and fastened to it is a horizontal disc of thin iron plate, having 200 or 300 teeth in its circumference, and also two rings of holes near the circumference. One ring has twice as many holes as the other. A piece of quill glass tubing is bent to 135° at one end.

The humming top is spun on a hard surface. A card is held against the toothed wheel. A note is produced, which becomes lower in pitch as the top moves slower. Air is blown through the tube on to the outer and on to the inner ring of holes. The note produced by the former is always an octave higher than that by the latter.

11. To show that the rate of vibration of a stretched string varies inversely as its length, other things being the same, fasten two similar iron wires to the wood-screws of a monochord. Pass the other ends over the brass pullies and fasten equal weights to them, say 28 lbs., using the whole lengths of the wires from the fixed bridge to the pullies. Pluck the wires in the middle, and the same notes will be given. Insert a bridge half way between the one pulley and the bridge under one wire, the shortened wire gives the octave higher than the unshortened wire. Insert bridge anywhere in the other string. Make one string half as long as the other, and the shorter string always gives the higher octave or twice as many vibrations in a second as the longer one.

12. To show that the number of vibrations increases with the stretching force or weight, fasten two weights over the pullies and let one weight be four times as great as the other. The wire with the heavier weight gives the octave higher than the one with the lighter weight. And this is the case if the bridges are inserted anywhere, provided the two are at the same distance from the pullies.

13. Combine results of the last two experiments. That is, hang any two unequal weights from similar wire over the pullies, and use the whole length of the more weighted wire; shift the bridge of the less weighted wire till the two give the same note. It is then found that if the wire A has the greater length it is stretched by the greater weight.

[14. Show that, other things being the same, the number of vibrations varies inversely with the thickness of the wire. Obtain the relative thicknesses of two iron wires; vary the weights which stretch equal lengths till there is unison. Then prove that the thicker wire is stretched by the greater weight.]

LIGHT.

Propagation in straight Lines.

Shadows. (15.)
Images formed by pin-holes. (16, 17.)
Decrease of illumination with distance.
Law of inverse square. (18, 19.)
Simple photometers. (20.)

Experiments and Illustrations.

15. Place a stick vertically between the wall and a long thin luminous gas flame. Notice that the shadow of the stick is sharply defined. Place stick or flame horizontally. Show penumbra.

16. A pin-hole camera should be made as follows. Make two paste-board tubes by rolling pasted paper on a wooden cylinder, so that one fits inside the other. For the wider tube, previously cover the cylinder with dry paper. Cover one end of the wide tube with tinfoil, and make a pin-hole in the middle. Cover one end of the narrower tube with tissue paper, and thrust this end in the wider tube. Line with black paper. Notice pictures on the tissue paper.

[17. Cover a lantern cap with tinfoil, remove the condensing lens, and place the cap on. Make pin-holes in the cap. For every pin-hole there is an image formed on the screen. Make the pin-holes more and more numerous, and near together, till the images overlap and become confused. At last diffused light is produced, which is an overlapping of images.]

18. Make a tall rectangular pyramid of wire. Stretch across the base three threads at equal distances parallel to one side, and three parallel to the adjacent side, so as to divide the base into 16 squares. Fasten a square of wire around the pyramid half-way up, and tie two threads across it, bisecting the sides, thus forming four squares. At a quarter distance from the top fasten a square around. All the squares are equal.

19. Fasten a square of wire in a clamp, and place it in an otherwise dark room, half way between a candle and the wall. Cut a square sheet of paper so as just to cover the shadow of the frame. Fold it across and across, and it will fit the frame itself.

20. Shadow Photometer.—Place an opaque rod of not less than 1 in. diameter vertically at about 3 feet from a white screen. Place a candle about 2 feet further off nearly in the plane through the rod perpendicular to the screen. Place another candle so near the first that the two shadows are close together. Move one candle to and fro till the shadows of are equal depth, that is, are equally illuminated. The brighter light will be furthest off. The illuminating powers are in the proportion of the squares of the respective distances from the screen. Confirm this by making a cluster of two or three candles close together at one place, and using a single candle of the same brightness at the other.

Reflection.

Laws of reflection. (21, 22, 23.)
Position and nature of images formed by plane mirror.

Experiments and Illustrations.

[21. Fasten a little whitened wooden stick with wax perpendicularly at the centre of a plane looking-glass. Cast upon the mirror at the foot of the rod a beam of parallel rays from the lantern or a sunbeam coming through a hole in a screen. Notice (*a*) that the reflected beam always makes the same angles with the mirror and the stick as the incident beam does, and (*b*) that the incident beam, the stick, and the reflected beam all lie in one plane.]

22. At one end of a piece of board 1 ft. long by 4 in. wide fasten by sealing wax a cork upright, through this pass horizontally a piece of glass tube about 2 in. long and ¼ in. internal diameter. Stretch a vertical thread across the opening of the tube nearest the other end of the board. Towards the other end on the same side fasten a circular sheet of card-board divided into degrees, the 0° being nearest to the tube and in the middle of the board. Pivot in the centre of the circle two radial arms one above the other, one carrying at its end a vertical pin, the other a central mark. The second carries a 2 in. square piece of silvered glass

in a vertical plane perpendicular to the arm. The pin bearing arm being placed anywhere, the mirror bearing arm is turned till the reflexion of the pin is seen and coincides with the thread in the tube. Whenever this is the case, the reading of degrees where the pin is always twice as great as where the marked arm is.

23. Refer to reflection from surface of still water and reflection after sunset from elevated clouds.

Simple refraction and Images.

A ray of light passing from a less dense to a more dense medium is bent towards the perpendicular to the separating surface and conversely. (24, 25, 26, 27.)

Formation of images (1) by concave mirror, (2) by convex lens. (28, 29, 30, 31.)

Burning-glass.

Experiments and Illustrations.

24. Place a coin at the bottom of a basin and place the basin so that the coin is hidden by the edge. Pour in water till the coin becomes visible.

[25. Stretch wire across opening in cap of lantern. Focus shadow of wire on screen. Interpose strip of glass in front of wire and tilt the strip. Notice displacement of part of shadow.]

[26. Focus on the screen a small circular hole in the cap of the lantern. Introduce wedge of glass and show that the spot is moved towards the base of the wedge. Let the first face of the wedge be oblique to the beam. Put the second wedge with the first, face to face and base to base, so as to form a single wedge of double the angle. Notice the double displacement of the light spot. Put them edge to base; notice the emergent beam is parallel to the incident.]

[27. Place a glass cell before the lantern and focus it on the screen. Let the surface of the water be visible. Add a lump of ice on the water, observe the streaky appearance of the illuminated part of the screen. Add syrup, alcohol, and hot water, by a pipette. Pour the vapour of ether out of a bottle. Examine shadow of burning gas, red-hot poker, and platinum wire, through which a current of electricity is passing.]

28. Show in an otherwise dark room that if a candle is at 20 feet distance from a concave spherical mirror the light will be focussed to a point half way between the centre of the mirror and its centre of curvature. Catch the light so focussed on a small paper screen.

29. Advance distant candle flame towards the mirror, move it up or down. Show that the focus advances to meet the light and that when the light is raised the focus is depressed, and conversely. Show that when the candle flame is at the centre of curvature there also is the focus. When the flame is between the centre of curvature and the principal focus the focus of the flame is further away than the principal focus. When the flame is in the principal focus the reflected rays are parallel, or the focus is at an infinite distance. When the flame is still nearer the reflected rays diverge, so that they cannot be caught on a screen, but appear to come from a point behind the mirror. Repeat all these with a fish-tail burner, and notice the inversion of the image in all cases but the last. Notice that in all cases where a real image is formed the flame and the image may change places.

30. Determine principal focus of a double convex or plano-convex lens. This is done by measuring distance from lens where the focus of a distant point or image of a distant body, say, sun or moon, is formed with a lens.

31. Make a series of experiments similar to those with concave mirror, that is, examine image of fish-tail burner when the burner is 20 feet off. Catch the image (close to the principal focus) on a screen on the other

side of the lens. Notice the image is smaller than the flame and inverted. Advance the burner towards the lens. Observe the image grow in size, and retreat from the lens. When the flame and its image are of equal size they are equidistant from the lens (this corresponds with the flame and image, both being in the centre of curvature of the concave mirror). Advance the flame nearer; the image increases and retreats. When the flame reaches the principal focus the refracted rays are parallel, or the focus is at an infinite distance. Nearer yet, the rays after refraction diverge, and would meet if produced on the same side of the lens as the flame. Hence deduce magnifying property of common lens when held near the eye or near an object. Show that the image and object may always change places if there is a real image. Being on the same side of the lens as a real image, magnify the image by a hand lens.

Explain astronomical refracting telescope.

General notions as to the composite character of white Light. (32, 33, 34, 35, 36.)

Decomposition of white light and its recomposition, colour of objects.

Experiments and Illustrations.

32. Paint disc of cardboard in segments of violet, blue, green, yellow, orange, and red: fasten it on a top and spin. Notice the blending of the colours by retention of images into a grey.

[33. Make a solution of sulphate of copper, 2 of sulphate to 20 of water. Add ammonia till the precipitate is re-dissolved. Place solution in glass cell. Focus a round hole in lantern cut on screen. Interpose above solution. Notice pure blue colour. Interpose red glass either before or after the cell. Notice total extinction of light.]

[34. Paint sheets of cardboard with various brilliant colours. Send the light in an otherwise dark room upon these, and catch reflected light on white sheets of cardboard.]

[35. Use the bisulphide prism to produce a long spectrum of a slit on lantern cap. Pass through the spectrum (*a*) the glass cell containing as many coloured transparent solutions as you have. Notice the shadow of the cell. Pass through the same spectrum various coloured opaque bodies, such as flowers.]

36. Take a strip of white paper about $\frac{1}{10}$ inch wide and 2 inches long, place on a sheet of black paper, and view it through a prism (a common chandelier drop will answer). Notice that a spectrum is produced. In the prolongation of the white strip place a similar strip of coloured paper, and notice the absence or faintness of some of the colours of the spectrum. Sprinkle salt on the wick of the spirit lamp; view flowers and other coloured opaque bodies by this light.

HEAT.

Distinction between Heat and Temperature.

Difficulty of estimating the temperature of substance by touching it. (37, 38.)

Construction of mercurial thermometers. (39, 40.)

Fahrenheit and Centigrade scales.

Expansion:

Of solids—

Expansibility different for different substances. (41, 42, 43.)

Force necessary to resist expansion or contraction. (49.)

Of liquids—

Unequal expansion of liquids. (44.)

Contraction and expansion of water when heated. (50.)

Importance of these facts. Temperature of water in lakes above the ice-point when ice is forming on the surface.

Of gases—

Expansion of air. (45, 46, 47, 48.)

Experiments and Illustrations.

37. Mix hot and cold water. No heat is added or subtracted, but the temperature of the mixture is different from the temperature of the two masses of water before mixture.

38. Plunge one hand into hot water, the other into ice-cold water. Plunge both into lukewarm water. Notice that the cooled hand feels warm, and the warmed hand cool.

39. Illustrate method of filling thermometer bulb and determining fixed points.

40. Place thermometer amongst pieces of melting ice. Also in boiling water. Note the temperature 0° C. and 100° C. (32° F. and 212° F.). Add a little salt to the ice and to the water; note again.

[41. Cut a round hole in a sheet of tin plate exactly large enough to let a round-bottomed 4 oz. flask pass through. Fill the flask with boiling water; it will not pass through till the plate has got warm. Stretch a long piece of platinum wire between metallic supports. Heat it by means of a galvanic current. It becomes slack.]

42. Solder together side by side a brass and iron wire, each about 2 feet long. Hammer the compound wire straight, and notice how it bends when heated. Fuse a piece of platinum wire through the side of a glass tube, and notice that the glass does not crack on cooling.

43. Refer to (1) cracking of thick glass vessels when boiling water is poured into them, (2) necessity for leaving an interval between the ends of consecutive rails on railways.

44. Fit with corks the necks of the three 4 oz. flasks. Fit tightly into the corks three narrow glass tubes open at both ends. Fill the flasks with water, alcohol, and oil of turpentine respectively. Push in the corks till the liquid stands in each at the same height. Put all three to the same depth into a vessel of warm water. Notice that the expansion of the glass causes a momentary sinking of the liquids; that ultimately the expansions are very different.

45. Fit a 2 oz. flask with a tight cork through which a tube passes, the other end of which is bent down and then up at the end. Clamp the flask so that the end of the tube dips under water in a basin. Fill a test tube with water, and invert it over the end of the tube. Warm the air in the flask, and collect the expelled air in the test tube.

46. Fit tightly a cork through which a straight tube passes into the neck of a 2 oz. flask. Turn over and pass the tube through the cork in the neck of a wide-mouthed bottle containing coloured water. Warm the flask with the hand so as to expel some of the air, and let the liquid rise in the stem. (An air thermometer.)

47. Fasten two such flasks together air-tight by a tube bent six times at right angles and containing some coloured liquid in the middle bend. Show that the liquid moves if one flask is warmed more than the other.

[48. Fit corks and bent tubes into two flasks as in 45. Fill one tube with air, and the other with coal gas. Cover equally in the same vessel with hot water. Collect expelled gas in two test tubes full of water. Show that the quantities driven out are nearly equal.]

[49. Place a hermetically sealed and filled tube of water in a basin, cover it with a cloth, and pour hot water on it. Notice it burst.]

[50. Cool a flask in melting ice; fill it full with ice-water (the water from melting ice), fit in cork with tube, well fitting till liquor stands in

tube. Allow to get warm. Notice shrinking followed by expansion Repeat the experiment, and observe the temperature of the water when its volume is least; show that the temperature is + 4° C. (39·2° F.).]

Capacity for Heat.

Unequal capacity of different bodies for heat. (51, 52, 53, 54.)

Influence of high capacity for heat of water on the climate of the British Isles.

Experiments and Illustrations.

51. Heat equal weights of lead and water in the same beaker. Provide two other beakers containing equal weights of cold water. Put the hot lead into one of these, the hot water into the other. Stir and note the temperatures.

52. Show similarly that 1 lb. of water which was at the atmospheric temperature, and has been heated by contact with 1 lb. of iron at 100°, is not so hot as the 1 lb. of water which was at 100° and has been cooled by contact with 1 lb. of iron at the atmospheric temperature. [Pour the water in the two cases into beaker glasses, and plunge in the two air thermometer bulbs, if a differential air thermometer can be used.]

[53. Shake up known weights at known but different temperatures of water and mercury, water and turpentine. Confirm by shaking up mercury and turpentine. The relative capacities for heat are inversely as the weights, and inversely as the range of change of temperature.]

54. Heat equally (to about 150° C.) in an oil bath cylinders of different metals fastened to thin wires. Lay them simultaneously on a cake of beeswax ¼ inch thick on retort stand. Notice the order of falling through of those which do so, and the depth to which the others sink.

Change of State.

Many solids change into liquids, and liquids into gases, at definite temperatures. (55, 56, 57.)

Note exceptions, such as pitch, mixtures of different liquids, &c.

During the change of state heat is absorbed without rise of temperature. This called latent heat. (58, 59, 60, 61.)

Influence of pressure on the boiling point of water. (62, 63.)

Heights can be determined by observation of the boiling point.

Experiments and Illustrations.

55. Put large water thermometers into mixture of melting ice and water at 0° C., and into boiling water. Note that the temperatures are fixed.

56. Notice that ice floats in water. Soften and blow a small bulb on the end of a glass tube. Fill the bulb with water, seal in the gas flame, and put it in a mixture of ice and salt. Observe bulb burst.

57. Fill a flask with mixture of ice and water, fit in neck well-fitting cork with long narrow tube till water stands at a certain height in tube. Observe how it sinks as the ice melts.

58. Put some ice into a known weight of hot water. Notice the temperature when the ice is melted. Determine the weight of the ice by reweighing the water. Point out that a small quantity of ice requires a large quantity of heat to melt it. Explain the slow melting of snow after a thaw has set in.

59. Pass steam, produced by heating water in a flask, through a delivery tube into cold water. Notice the rapid rise in temperature, and determine the weight of water condensed.

60. Place a few drops of water between the bottom of a small beaker and a block of wood. Put some ether into the beaker and blow over it with a pair of bellows having a tube fastened to the nozzle. The water will freeze.

61. Notice the liberation of heat when a cold body condenses the steam from a kettle.

62. Get a very well-fitting, soft, long, and sound cork to fit the neck of a 4-oz. round-bottomed flask. Boil water in the flask till all the air is expelled. Remove burner, and cork up the flask as nearly at the same instant as possible. Turn the flask over and pour cold water on the top. Also immerse the corked flask in cold water, and observe in both cases the ebulition under diminished pressure.

[63. Connect flask containing hot water with the air pump. Show that the water begins to boil when the pressure is reduced. Use an intermediate flask to prevent water vapour from passing into the interior of the pump.]

Conduction and Convection.

Conduction in solids and fluids. (64, 65, 66, 67, 68, 69, 70, 71.)
Convection in fluids. (72, 73.)

Experiments and Illustrations.

64. Wrap a piece of paper smoothly around a brass tube and hold in air-gas burner. The paper is not scorched. Wrap the paper around a wooden rod of the same size, and heat; the paper is scorched.

65. Twist an iron and a copper wire together at one end. At about 4 inches from the joint fasten a marble on each with beeswax. Heat the joint in an air-gas flame. Notice that the marble on the copper is the first to fall.

[66. Place a cylinder of metal on an air thermometer. Notice height of liquid in stem. Heat a copper cylinder in boiling water, dry it, and place it on the first cylinder. Wait two minutes. Note the depression. Remove the cylinder and restore the temperature. Perform the same experiment with other metal cylinders, always using the same copper one as a heater. Notice the difference of depression with different metals. Cut cylinders of wood, cork, &c. and show that they arrest nearly all the heat.]

67. Make a short coil of stout copper wire, $\frac{1}{8}$ inch internal diameter. Pass it over the wick of a candle without touching the wick. The candle is extinguished.

68. Turn on, but do not light, a gas jet. Hold over it a wire gauze and light the gas above the gauze. Notice that the flame does not strike through. Principle of Davy lamp.

69. Put a piece of ice in the bottom of a long test tube, weight it down with a piece of lead. Add water above. Hold obliquely and boil the water over an air gas or spirit lamp flame without melting the ice.

70. Examine shadow of red-hot poker. Notice that the heating of the air as exhibited by its refraction extends a very little way downwards, showing the air is a bad conductor.

71. Place a little lime in the palm of the hand and bring the point of the hot poker upon it. The air amongst the lime refuses to conduct, and the hand is not burnt.

72. Heat over a small flame a round-bottomed flask full of water. Throw into the water some solid colouring matter, like cochineal, aniline dye, litmus, &c. Notice how the hot and coloured water ascends.

73. Fasten the end of a candle on to a plate and light it; surround the candle with water. Place over the candle a cylindrical glass shade. Notice the extinction of the candle. Repeat the experiment and introduce down the centre of the cylinder a cardboard diaphragm,

Notice that the candle continues to burn. Hold some smouldering brown paper near one side of the cardboard, and notice the direction in which the smoke moves.

MAGNETISM.

Principal properties of Magnets.

Attraction of iron by magnet. (74, 75.)
In case of long thin magnets iron attracted chiefly by ends. Poles. (76.)
Direction assumed by magnet which can move freely in a horizontal plane. Mariner's compass.
Magnetic meridian. (77.)
Difference between the poles. Names of poles. Mutual behaviour of like and unlike poles. (78.)
Soft iron under the influence of a magnet is itself magnetised.
Sort iron is magnetised easily, but temporarily. (80, 81, 82.)
Steel with difficulty, but permanently. (83, 84.)
The magnet points north and south, because the earth is a magnet, the poles of which are near to the geographical pole. (85.)
Dipping needle. (86, 87.)

Experiments.

74. Exhibit two pieces of steel, one magnetised, the other unmagnetised. Show that one does, and the other does not, attract iron.

75. Neither attracts sawdust.

76. Iron filings collect chiefly at the ends of a magnetised knitting needle and equally at both ends.

77. Attach a magnet and small rod of iron and wood to three corks; float each in turn in a basin of water, and prove that the magnet alone tends to set itself N. and S.

78. Suspend two magnets and a rod of iron so that they can move in a horizontal plane. Mark the north-seeking ends. Dismount one of the magnets, and observe the effects when the poles are in turn brought near the two ends of the magnets and iron rod.

79. Hold one end of a bar of soft iron in iron filings and bring a magnet near to the other end. Repeat with wood instead of soft iron.

80. Hold a bar of soft iron and a magnet in a straight line, and test by another magnet the nature of the pole produced at the extremity of the iron farthest from the magnet.

[81. Hang a number of iron wires of equal length from one pole of a magnet and observe how the other ends repel one another.]

82. Hang by a silk fibre a soft iron nail horizontally over the poles of a horseshoe magnet standing on its bend in a vertical plane. Bring pole of another magnet near one end of nail, and obtain repulsion if the pole of the moveable magnet is of the opposite kind to that of the fixed one.

83. Repeat with magnet reversed. Repeat with hard steel substituted for soft iron. Magnetic chain.

84. Magnetise steel knitting needles by single touch. Prove that the end last touched is a pole of opposite name to the touching pole.

85. Hold a strong magnet under a magnet which can turn in a horizontal plane. Show that the latter takes up a position in which its poles point to those of the former.

86. Fasten firmly with hot shellac a silk fibre to the middle of a piece of unmagnetised knitting needle. File off one end till the needle hangs horizontally. Magnetise it, and notice the dip.

[87. Hold a poker in the magnetic dip, and in the magnetic meridian, that is, parallel to the magnetic axis of the earth. Hit its upper end with a hammer and show that it becomes magnetic in such a manner that its N. seeking end is downwards, and towards the north. This shows that the magnetism at the north geographic pole is south seeking.]

ELECTRICITY.

Instruments for Detecting Electrification.

Pith balls. Balanced rods. Gold-leaf electroscope.

Electrification.

Electrification by friction. (88 to 95.)

Experiments and Illustrations.

88. Balance a lath upon the inverted bottom of a round flask which may stand on its neck, or the neck may be placed in or over the neck of a wine bottle.

Rub smooth face of resin on hot dried flannel, and hold to one end of lath. Notice approach.

89. Rub a dry and hot sheet of brown paper with a clothes brush, fold it up and bring it towards the lath. Notice approach.

90. Heat mahogany board and heat foreign-post paper; rub the paper on the board with a piece of india-rubber. Pick the paper off. Notice crackling and sparks in dark room. Lay it on other side of board, also on wall. Notice how it clings: also attracts the lath.

91. Arm two fingers with pieces of vulcanized caoutchouc tubing. Draw silk ribbon between. Observe the ribbon cling to wall, also that it attracts the lath. [Draw collodion film between dry fingers, and observe attraction to lath.]

92. [Spread amalgam upon silk rubber, warm thoroughly, and use while warm. Close one end of thick glass tube 2 feet long. Heat thoroughly. Rub amalgamed silk on glass till crackling is heard. Show how electrified glass attracts feathers, gold leaf, lath, &c. The silk rubbers improve very much by use.]

93. Rub stick of shellac with dry flannel, and repeat on substances used in last experiment.

94. Rub stick of sulphur and repeat.

95. [Excite glass with amalgamed silk, also sealing-wax with flannel, and place each in succession on wire stirrup, and hang up by thread. Notice how each moves towards the hand when held near.]

Two kinds of Electrification.

Positive and negative or vitreous and resinous electricity. (96 to 100.)

Experiments and Illustrations.

96. Show that shellac or sealing-wax rubbed with flannel is attracted by glass rubbed with amalgamed silk.

[97. Show that sealing-wax rubbed with flannel is repelled by sealing-wax rubbed with flannel (one piece on wire stirrup), and that glass rubbed with amalgamed silk is repelled by glass rubbed with amalgamed silk. Show that sulphur rubbed with flannel is repelled by wax rubbed with flannel.]

98. Excite thin sheet of writing paper on hot mahogany board with a piece of india-rubber. Cut it into strips as it lies with a sharp knife, leaving a band at one end, hang it from a thread fastened to a bent pin. Notice now the strips repel one another. Bring near them a glass rod excited with amalgamed silk. Observe general repulsion. Observe attraction to excited sealing-wax.

99. Touch top of electroscope with excited sealing-wax, sulphur, glass, &c., in succession, and observe increased divergence or collapse of leaves.

100. Heat glass very hot, rub with fur, and notice that the glass acquires the same kind of electricity as sealing-wax rubbed with flannel.

Difference between Conductors and Insulators.

Distinction between good and bad conductors and insulators. (101 to 104.)

Experiments and Illustrations.

101. Fasten one end of a fine copper wire, five yards long, through the hole in the electroscope; make a loop at the other end, place the loop over a glass tube, and having excited the tube with amalgamed silk, let the loop slide along the tube. Notice divergence of leaves. Use sealing-wax and flannel as above. Also replace wire by cotton thread, dry silk thread, and wet silk thread. Show that the earth is a conductor.

[102. Make insulating stool. Varnish four strong glass tumblers. Place on the top the mahogany board.]

[103. Stand on stool, touch electroscope with finger. Let the coat be struck by another person with a fur skin.]

104. Paste tin-foil or Dutch metal on both sides of cardboard. Cut out round discs of various diameters and fasten on to ends of sticks of shellac or thin varnished glass tubes. Show the use of these as proof planes.

Simultaneous and equal Production of two kinds of Electrification. (105.)

Experiment.

105. Rub sealing-wax with flannel wrapped round it. Place the two on the top of the electroscope. Notice that at first there is no effect but the leaves diverge when the sealing-wax is withdrawn from the flannel.

Induction.

Effect of electrified bodies on unelectrified conductors. (106–110.)

Experiments and Illustrations.

106. Use proof plane by touching electrically excited bodies, and then, touch the electroscope, determine which are $+^{ly}$ and which $-^{ly}$ electrified. Show that the proof plane when neutral will cause a partial collapse of the leaves however excited: that when electrified with the opposite kind the proof plane may also produce partial collapse, total collapse, or the latter followed by divergence.

107. Bring electrically excited body near to electroscope. Observe divergence of leaves; followed by collapse on withdrawal.

108. Put the hand on electroscope. Approach $\pm$ electrified body. Then remove the hand. Then remove the electrified body. Notice that the leaves diverge with $\mp$ electricity.

109. Place two insulated conducting balls in contact with one another. Bring excited glass near one, remove the other, then the glass. Show that the ball nearest to the glass has $-^{ve}$, the other $+^{ve}$. Show the converse with shellac.

110. Bring the excited glass near one side of an insulated ball; touch the side nearest to glass with proof plane. Show that the plane becomes $-^{ve}$. Touch other side; show that the plane becomes $+^{ve}$. Touch the ball momentarily anywhere with the hand: then remove the glass and show that the whole ball is $-^{ve}$. The converse with shellac.

Simple Explanation of Frictional Electrical Machine.

Potential.

Simple explanation of bodies being at different electrical potential if electricity passes between them when they are put in conducting communication. Analogies with temperature and level.

If copper wires are attached to plates of Zn and Cn immersed in dilute acid, they are at different potentials. If the wires are connected an electrical current passes round the circuit. Work is done not by a machine, but by chemical action. Direction of flow of positive electricity.

An Electric Current.

(1.) Heats the conductor in which it is flowing. (111.)

(2.) If the conductor is acidified water it is broken up into its chemical constituents. (112.)

If a metallic salt is dissolved in the water the current may deposit the metal on the plate or wire by which the current leaves the liquid. (113.)

(3.) A magnet in the neighbourhood of an electric current tends to set itself at right angles to the direction in which the current is flowing. (114, 115.)

(4.) A coiled conductor in which a current is passing behaves as a magnet and magnetises a bar of soft iron placed within it.

Experiments and Illustrations.

111. Exhibit glowing platinum wire spiral.

112. Exhibit electrolysis of acidulated water.

113. Electrolyse various solutions of metallic salts (*e.g.*, sulphate of copper, nitrate of silver, sulphate of iron, acetate of lead, &c., avoiding chlorides), show that the metal separates at the $-^{ve}$ pole.

114. Suspend a magnet over a wire, running north and south, whose ends are connected with the poles of a battery. Notice that the needle is deflected and note the direction. Note also that the direction of inflection is reversed if the wire be above the needle.

[115. Principles of telegraphy.]

116. Wrap covered copper wire round a poker from end to end in a right-handed spiral, and attach ends to battery. Examine polarity of poker, keeping connexions with battery the same, reverse the spiral. Reverse in both cases the battery connexions. Examine polarity in each case. Wrap the wire round the poker continuously from end to end and back again. Again examine polarity.

117. Make an electro-magnet out of a horse-shoe.

[118. Wrap a covered copper wire into a helix, bring the ends round inside the helix to the middle, then through the helix and through a flat cork. On one end fasten a piece of zinc and on the other a piece of copper. Float the whole on dilute sulphuric acid (1 : 12). Show that the coil floats N. and S. and that one end is attracted and the other repelled by the N. end of a magnet. Deduce from this that the polarity of the coil is the same as that of the induced magnet inside. Confirm this by examining the polarity of the coil of 61 and the polarity of a rod of iron placed inside it.]

119. Construction of simple form of electric bell.

SUBJECT VIII.—SOUND, LIGHT AND HEAT.

Candidates in the first stage must take it as a whole, and will be expected to answer questions in Sound, and in Light, and in Heat.

In the second stage, and in the examination for honours, the subject will be taken in three sub-divisions, and a candidate will be allowed to take up one or more of the sub-divisions, viz., Sound, Light, or Heat, in the same or in different years. But no candidate may offer himself for the honours examination in any subdivision unless he has passed the second or advanced stage in that subdivision.

It must be distinctly understood that candidates when answering questions on the explanation of physical phenomena are expected to be acquainted with the mechanical principles on which these explanations are based, and also that problems may be set involving a knowledge of the facts or formulæ referred to in the syllabus.

NOTE.—An outline of elementary experiments, together with a description of the necessary apparatus, for illustrating this subject has been prepared; this (Price 6*d.*) and a syllabus of the course of practical instruction in Physics at the Royal College of Science, South Kensington (Price 1*s.*), may be obtained. [*See* list of publications at end of Directory or Form 1123.]

FIRST STAGE OR ELEMENTARY COURSE.

SOUND.

Sound produced by vibration. Sound transmitted through solids, liquids, and gases.

Study more particularly air.

Air particles have only vibratory motions.

Longitudinal and transversal vibrations.

Sound wave consists of alternate compressions and rarefactions.

Simple harmonic vibration of a pendulum. Amplitude of vibration.

Vibration frequency. Wave length.

Velocity of sound. Methods of measuring velocity on a large scale in (1) air, (2) water.

Velocity greater in warm than in cold air.

High and low notes travel with the same velocity.

The loudness of a sound depends upon the amplitude of the vibration of the particles.

The pitch of a sound depends upon the frequency of the vibrations.

The fact that high and low notes travel with the same velocity proves that the wave length varies inversely as the frequency.

Reflection of sound. Angles of incidence and reflection equal. Echoes. Whispering galleries. Speaking trumpet.

Acoustic transparency of the air.

LIGHT.

Propagation in straight lines. Shadows. Penumbræ. Images formed by pinholes.

Intensity of light. Law of change of intensity with change of distance from a luminous point. Photometry.

Reflection of light. Plane mirrors. Parallel and inclined plane mirrors. Concave and convex spherical mirrors. Methods of determining the position of the principal focus of a concave mirror (1) by optical experiment, (2) from the radius of the mirror (supposed known). Formation of images. Real and virtual images. Conjugate foci treated experimentally. Geometrical construction for the image of a small object on the axis of the mirror when the position of the centre or principal focus is given.

Refraction of light. A ray of light passing from a less dense to a more dense medium is bent towards the perpendicular to the separating surface and conversely. General form of the path of a ray of light passing through (1) a plate, (2) a prism, (3) a lens.

Thin convex lenses. Methods of determining by experiment the position of the principal focus of a convex lens.

Formation of images. Real and virtual images.

Conjugate foci treated experimentally. Geometrical construction for the image of a small object on the axis of the lens when the position of the lens and of its principal foci are given.

Refractive index.

Application of the convex lens to prove that the ratio of the distances from a plane refracting surface of an object, and of its image formed by refraction at the surface, is constant and depends only on the nature of the two media on each side of the surface.

Definition of refractive index as ratio of these distances.

Hence geometrical constructions for the path of a ray of light through (1) a plate, (2) a prism.

Heat.

Distinction between heat and temperature.

Construction of mercurial thermometer.

Different thermometric scales.

Expansion of solids. Linear and cubical expansion.

Effects of unequal expansion.

Expansion of liquids. Cause of the difference between absolute and apparent expansion.

Peculiarity in the expansion of water.

Expansion of gases.

Specific heat. Calorimeters. Method of mixtures. Consequences of the high specific heat of water.

Fusion and solidification. Melting points. Meaning of the term latent heats. Change of volume during fusion. Effects of frost.

Boiling points. Meaning of the term latent heat of vaporization.

Convection of heat in liquids and gases.

Heating buildings by hot water. The Gulf Stream and ocean currents.

Conduction of heat. Effects due to the high or low conducting power of various substances.

Second Stage or Advanced Course.

The advanced course in each subdivision is as follows. But a candidate will be expected to have a knowledge of all the matters which are included in the first stage. Thus a candidate who takes up Sound in the advanced course will be expected to have a knowledge of light and heat equivalent to that required in the elementary course, and so on.

VIII*a*.—Sound.

Wave velocity.

Relation between wave length, vibration frequency, and velocity of wave propagation.

Boyle's law.

Meaning of the terms stress, strain, co-efficient of elasticity. Measures of these quantities in a gas.

Newton's relation between the velocity, elasticity, and density.

Effect of changes of temperature, and of pressure on the velocity of sound in a gas.

General explanation of Laplace's correction of Newton's formula.

Methods of measuring velocity of sound.

Reflection and refraction of waves. Explanation and application to the reflection and refraction of sound.

Musical tones. Methods of measuring pitch. Musical scales. Temperament.

Interference of waves. Beats. Relation between the frequency of beats, and the frequency of the notes which produce them. Comparison of tuning forks with a standard. Tartini's beats.

Modes of vibration. Stationary vibrations.

Nodes and nodal lines.

Transversal vibrations of strings.

Change of pitch due to changes in the length, diameter, material, and stretching force of a string vibrating transversely.

Harmonics.

Melde's apparatus.

Transversal vibrations of rods.

Tuning forks.

Longitudinal vibrations of strings, rods, and columns of air.

Change of pitch due to changes in the length, diameter, material, and stretching force of a string vibrating longitudinally.

Mouth (or flue) organ pipes open and stopped. Harmonics. Galton's whistle.

Vibrations of plates. Chladni's figures.

Bells.

Resonance. Forms of resonators. Analysis of compound notes. Sympathetic vibrations. *Timbre* or quality of notes. Consonant and dissonant intervals.

Theory of discords.

Composition of the vowel sounds.

VIII*b*.—Light.

Reflection. Goniometers. Hadley's sextant.

Proof of the algebraical relations between the focal length of a spherical mirror and the distances of an object and its image from it. Applications of the formula to simple cases.

Parabolic mirror.

Spherical aberration. Caustics.

Refraction. Definition of the sine of an angle.

Calculation of the sines of the angles of a right-angled triangle when two of the sides are given.

The laws of refraction.

The refractive index expressed as the ratio of the sines. Proof of the relations between the refractive index and the distances of an object and its image from (1) a plane, (2) a spherical refracting surface.

Spherical aberration. Focal lines.

Total internal reflection. Critical angle.

Deviation. Calculation of the deviation of a ray on passage through a prism.

Methods of measuring refractive indices.

Methods of determining the focal lengths of lenses.

The principle of the telescope and microscope, astronomical telescope and opera glass.

Dispersion. The composite character of white light. Calculation of the dispersion of a ray or passage through a thin prism.

Achromatism. Calculation of achromatic combinations of thin prisms and lenses. Construction of achromatic lenses.

The theory of light.

Methods of measuring the velocity of light (1) in interplanetary space, (2) in air, (3) in other media.

Explanation of the laws of reflection and refraction by (1) the emission theory, (2) the wave theory of light. Energy of radiation. The ether and its hypothetical properties. Crucial test between the two. Physical meaning of the refractive index. Relation between the properties of wave and light.

Interference of light. Colours of thin plates. Newton's rings. Fresnel's interference bands. Methods of measuring the wave length of light from interference phenomena.

Diffraction. The diffraction spectrum. Method of measuring the wave length of light.

Polarization. Passage of light through tourmaline and Iceland spar. Ordinary and extraordinary rays. Nicol's and other polarizing prisms. Polarization by reflection. Simple forms of polariscope and saccharometer.

Relations between light and ordinary matter. Spectrum analysis. Spectra produced by glowing solids, liquids, and gases. Physical explanation of these facts.

Displacement of lines in the spectrum by the relative motion of the observer and the luminous body. Applications of this fact and of spectrum analysis to astronomy.

Effects of the incidence of radiation on matter. Absorption accompanied by (*a*) the production of heat, (*b*) chemical action.

Extension of the spectrum beyond its visible limits. Selective absorption.

Relations between radiation and absorption by the same body. Absorption spectra.

Fluorescence, phosphoresence, phosphoroscope.

Colour vision. Colour blindness. Methods of testing. Trichromatic theory.

VIIIc.—Heat.

Sources of errors in the mercurial thermometer. Maximum and minimum thermometers.

The air thermometer at (1) constant volume, (2) constant pressure. Absolute zero of temperature deduced from the air thermometer.

Methods of measuring the expansion of solids, liquids, and gases.

Calorimetry. Accurate methods of measuring the specific heats of solids and liquids.

Specific heats of gases at constant pressure.

Atomic heat. Dulong and Petit's law. Anomalous specific heats. Specific heats of compounds.

Nature of heat. Definition of a method of measuring energy. Different kinds of energy. Transformation of energy of visible motion into heat.

The mechanical equivalent of heat.

The first law of thermodynamics.

Transference of heat. Physical nature of conduction. Physical nature of radiation.

The reflection of non-luminous radiation. Black bulb thermometers in air and vacuo.

The second law of thermodynamics.

The absolute scale of temperature.

Fusion and solidification. Changes in the melting points of bodies produced by pressure.

Black's and Bunsen's calorimeters.

Vaporization and liquefaction. Evaporation. Saturated and non-saturated vapours. General form of the isothermal curves of vapours and gases.

Condensation of aqueous vapour. The dew-point. Means of determining it. The hygrometric state of the air and its measurement. (The wet and dry bulb hygrometer. Condensation hygrometer.) Clouds. Rain. Snow and hail.

Expenditure of the latent heat of vaporization on internal and external work. Methods of liquefying and solidifying refractory gases, such as air, oxygen, &c.

Spheroidal state.

Gases. Joule's experiments on the internal work of expanding gases. Thomson's and Joule's experiments. Relation between the specific heats of gases at constant volume and constant pressure.

Adiabatic expansion or compression.

Determination of the ratio between the specific heats from the velocity of sound.

The principle of the method of calculating J from observations on gases.

Sublimation.

Applications of electricity in the construction of thermal instruments.

General principles of the galvanometer, thermopile, electrical pyrometer.

Honours.

Candidates can take honours in each of the above three subjects, viz., either in Sound, Light, or Heat.

In each case not only will an intimate knowledge be expected of the elementary course and of the advanced course corresponding to the subject in which the candidate offers himself, but questions may be set involving a knowledge of the relations between that subject and other branches of Physics. Questions may also be set which involve a knowledge of the calculus and of easy differential equations, though a choice will always be afforded so as to enable students who have not attained this knowledge of mathematics to gain a first class without it.

Candidates must also show themselves to be practically acquainted with the apparatus used in the study of the subjects in which they present themselves.

The examination will consist of a preliminary written paper, and those who qualify therein may be required to attend a practical examination at South Kensington at a subsequent date.

SUBJECT IX.—MAGNETISM AND ELECTRICITY.

Note.—An outline of elementary experiments, together with a description of the necessary apparatus, for illustrating this subject has been prepared; this (Price 6*d.*) and a syllabus of the course of practical instruction in Physics at the Royal College of Science, South Kensington (Price 1*s.*), may be obtained. [*See* list of publications at end of Directory, or Form 1123.]

First Stage or Elementary Course.

Magnetism.

General properties of magnets.—Attraction of iron. Action of magnets upon one another. Distinction between poles. Position of equilibrium of suspended magnet. Magnetic axis of a magnet. Names of poles. Behaviour to one another of like named and unlike named poles. Lines of magnetic force; their general distribution in easy cases as shown by means of iron filings.

Magnetic Induction.—Effect of a magnet on a neighbouring piece of soft iron. Diminution of the effect with increase of distance. Comparison between such effects on hard steel and on soft iron.

Permanent magnetisation of hard steel.—Methods of magnetisation by means of permanent magnets. Distribution of magnetism in magnets. Effects of breaking or subdividing magnets. Differences between the properties of different magnets depending upon their size, shape, and degree of magnetisation. Astatic needles and other simple combinations of magnets.

Terrestrial magnetism.—Magnetic meridian; Declination; Inclination (Dip). Mariner's compass and dipping needle; their behaviour at different parts of the earth. General explanation of the behaviour of compass and dipping needle on the assumption that the earth is a magnet. Magnetisation of soft iron by the earth.

Frictional Electricity.

Electrification by friction. Two distinct electrical states and their mutual relations. Positive and negative electrification. Simultaneous and equal development of the two electrical states. Action of electrified bodies on each other. Conductors and non-conductors. Conducting bodies are at different potentials if electricity passes between them when they are put in conducting communication. Analogies with temperature and level. Effect of connecting a conductor with the earth. To maintain a difference of potential between an earth connected conductor and the earth work must be done. Experiments illustrating the relation between a primary electrical charge and the correlative induced charge. The Leyden jar and similar arrangements. Distribution of electricity on conductors. Action of points. Properties of hollow conductors. Frictional electrical machines. Electric discharge.

Voltaic Electricity.

Experiments proving the different electrical conditions of two copper wires connected, one with a piece of zinc, the other with a piece of platinum or copper, the platinum or copper and the zinc both dipping into the same vessel of dilute sulphuric acid. Results of connecting the copper wires with each other. Description of the most common forms of voltaic cell. Connexion of cells in series to form voltaic battery. Increased difference of electrical conditions of terminal wires of a battery as the number of cells is increased. Evidence that this difference is of the same kind as that between the prime conductor and the rubber of a machine. Production of currents of electricity through conductors joining the terminals of a battery.

Properties and Effects of Electric Currents.—Evolution of heat, influence upon magnetic needles, magnetisation of soft iron, chemical action (*a*) inside the battery (*b*) outside (electrolysis). Magnetic properties of coiled conductors through which a current is passing. Current in the battery. The astatic galvanometer, and its application to the detection of weak currents.

An alternative syllabus for Stage I. of Science Subjects VIII. and IX. will be found at p. 170.

Second Stage or Advanced Course.

Magnetism.

The subjects of the elementary course, together with the following:

Every magnet exhibits the two opposite magnetic properties in an equal degree. Magnetic moment of a magnet. Comparison of magnetic moments. Law according to which the force between two magnetic poles varies with the strength of the poles and their distance apart, with its results and applications in simple cases. Mutual action of two small magnets at a distance from each other, especially in the case where the axis of one magnet produced bisects that of the other at right angles. Terrestrial magnetism. Determination of magnetic declination and inclination. Comparative measure of the intensity of the earth's magnetic force at different places and times.

Frictional Electricity.

The subjects of the elementary course, together with the following:

The quantitative law of electrical attraction and repulsion, with its results and applications in simple cases. Quantity and density of electricity; electrical potential; electrical capacity. Relation between capacity of a Leyden jar, the size of its coatings, and thickness and quality of the glass. Specific inductive capacity. Energy of an electric charge.

Description of construction and principles involved in the use of such instruments as the frictional electrical machine, condenser, Leyden jar, electrophorus, induction machine, electrometer.

Voltaic Electricity.

The subjects of the elementary course, together with the following:

Methods for the comparative measurement of the strength of currents, electromotive forces, and resistances in metallic conductors and electrolytes. Principles on which these methods depend; construction and use of instruments required for their practical application. Relation between electromotive force, resistance and strength of current. Meaning of the terms ohm, volt, ampère, and mutual relations of the quantities expressed by them. Divided circuits. Conditions determining the amount of heat developed in a conductor traversed by a current. Thermo-electricity. Thermal effects at junction of dissimilar metals when traversed by a current. Electrotype; Voltameters. Relation between the strength of an electric current and rate of chemical action produced by it.

Electro-magnetism and magneto-electricity.—Direction and magnitude of magnetic force in the neighbourhood of the current. Simpler laws of magneto-electrical induction. Magneto-electric machines for the conversion of mechanical work into current energy. Electro-magnetic machines, and the conversion of the energy of the current into mechanical work. Simple laws of attraction and repulsion of currents. Induction of currents.

Examination for Honours.

The subjects of the elementary and advanced course, together with absolute measurements of magnetic and electric magnitudes. The Examination will consist of a preliminary written paper, and those who qualify therein may be required to attend a practical examination at South Kensington at a subsequent date.

SUBJECT X.—INORGANIC CHEMISTRY, THEORETICAL.

First Stage or Elementary Course.

Chemical distinguished from physical changes. Indestructibility of matter Decomposible and undecomposible substances. Action of heated copper and mercury on air. Action of heated iron on steam. Gas formed by action of iron on steam passed over product of heating copper in air gives water. Action of metals on hydrochloric acid gas and upon solutions of hydrochloric acid and sulphuric acid. Production of hydrogen. Production of oxygen from red mercuric oxide. Formation of water by combustion of hydrogen in air or by explosion with oxygen in eudiometer. Identification of water by its physical and chemical characters. Mixtures distinguished from compounds. Laws of definite and multiple combination. Equivalents. Estimation of equivalents illustrated experimentally by deposition of such metals as silver or copper by zinc or magnesium and weighing. Physical properties of gases as distinguished from liquids and solids. Boyle's law. Law of expansion of gases by heat (without problems). Phenomena of gaseous diffusion. Molecules and atoms. Formation and properties of products of burning carbon in excess of air or oxygen. Comparison of gas so formed with gas obtained by treating chalk, &c., with acid. Composition of the atmosphere and action of animal and vegetable life. Systematic study of following elements and compounds, their condition in nature, usual methods of isolation and chief properties: hydrogen, oxygen, nitrogen, chlorine, hydrogen chloride (bromine and iodine to be exhibited and compared with chlorine), sulphur, sulphur dioxide, sulphur trioxide, and sulphurous and sulphuric acids, and a few of their most familiar salts, hydrogen sulphide, nitric acid and chief nitrates, nitrous oxide (from ammonium nitrate), nitric oxide (from nitric acid by copper), ammonia, carbon and its two oxides, properties common to acids in general.

Symbolic notation. Nomenclature. Formulæ and equations. Calculation of quantities by weight from chemical equations (French system of weights). Division of elements broadly into metals and non-metals. General characters

of metals. Basylous oxides and hydroxides, such as lime, caustic soda, zinc, oxide, black oxide of copper, and litharge, and the interaction of these with acids to form salts and water.

Alternative First Stage or Elementary Course.

The following is an alternative syllabus for Stage I. of Inorganic Chemistry, and is intended for those students who only require the elements of chemistry as a foundation for their studies in other subjects.

A paper will be set in each syllabus at the examination in May, and a candidate may take either, but not both. His success will be registered as a success in the elementary stage of Inorganic Chemistry, and no second payment will be made on account of the same class at a future examination in that subject.

Solution.—Solvent properties of water. Disappearance of a solid in water by solution. Saturation. Effect of increase of temperature on saturation. Effect of lowering the temperature on saturation. Crystallization. Filtration. Rain, spring, river, and pond waters, &c. Solid matter in different waters; how estimated. Loch Katrine water. Thames water. Sea water. Hard and soft waters. Mineral waters. Similar solvent action of other liquids. Solution of one liquid in another. Liquids insoluble in one another. Solution of gases in water and other liquids. The effect of heat on the quantity of gas dissolved by a liquid.

Experiments.—Suspend a piece of white sugar, on a tray of perforated zinc or wire gauze, by a thread in a glass vessel containing water. Dissolve salt in water. Show on a balance that sugar or salt and water when separate and when dissolved weigh the same. Show that salt is obtained from the solution by evaporation. Saturate water with nitre, and show that the solubility is increased by increase of temperature. Determine the solubility by evaporating to dryness equal quantities of a boiling solution and a cold solution and weighing the residue. Demonstrate the formation of crystals. Illustrate the removal of substances in suspension, and the non-removal of substances in solution by adding water to a mixture of black oxide of manganese and sugar, and then filtering. Show by evaporation the solid matter dissolved in a sample of pump, or river, or spring water, and explain the method for its quantitative determination. Show the like solvent action with other liquids, as camphor or shellac in alcohol, and fat or caoutchouc in ether. Compare the result of admixture of spirit or oil of vitriol with water with that of oil or mercury with water. Heat ordinary water and collect the expelled air.

Air.—Surrounds the globe. Wind is air in motion. Air occupies space. The bulk of any quantity of air is much changed by temperature and by pressure. Air has weight. The necessity of air for animals and plants. Bodies when burning require air. Air a mixture chiefly of two gases, viz., oxygen and nitrogen, with small quantities of water vapour and carbon dioxide. The proportion of nitrogen to oxygen. Oxygen the active body in air. Bodies burn in oxygen, and more brilliantly than in air. The combination of oxygen with iron and with other bodies. Increase of weight of bodies which unite with oxygen. Nitrogen combines directly with very few bodies. The nearly constant composition of pure air. Presence of other gases in small amount in air. Water in the air as a gas. The drying up of water.

Experiments.—That air occupies space may be shown by plunging a bell jar into a vessel of water. Fit a flask containing water with an india-rubber plug and delivery tube, heat the water, and collect the expelled air in a test tube inverted in a tumbler of water. Close the short limb of

a syphon tube containing air, and compress the air in the short limb by pouring in mercury. Weigh a flask full of air, and fitted with a cork, glass tube, caoutchouc tube, and clip; exhaust by sucking out the air, and weigh again. Show that a lighted candle is soon extinguished when burnt under a lamp-glass resting on the table, but that it continues to burn if fresh air be supplied by supporting the lamp-glass on two pieces of wood. Burn phosphorus in a tall bell jar over water, and show the diminution of bulk of air. Ignite phosphorus, place it in the remaining gas. Burn some phosphorus under a dry bell jar to show the compound of phosphorus and oxygen which is formed. Fix a pellet of phosphorus on the end of a piece of wire, and place in a test-tube graduated with a slip of paper and inverted in a tumbler of water to show that at ordinary temperatures it combines with the oxygen of the air and removes it, so that by measuring the volume of gas left the amount of oxygen contained in air can be roughly determined. Burn charcoal and sulphur in oxygen, and call attention to their disappearance. Demonstrate by lime water and by litmus paper respectively that a new body is in each case formed. Burn iron powder (*Ferrum reductum*) on a scale pan of a balance to show that an increase of weight occurs. A glass or metal vessel filled with ice or cold water can be used to show the condensation of moisture upon it. Place calcium chloride on the pan of a balance to show the gradual increase of weight which occurs by absorption of aqueous vapour from the air.

WATER.—Its three states. Expansion of water by heat. Equal volumes at different temperatures have not the same weight. Formation of currents in water by heating. Boiling point. Increase of volume on conversion of water into steam. Distillation. Pure water. Hydrogen and its properties. The burning of hydrogen in air, and the weight of the product (water) compared with the weight of the hydrogen; the difference due to oxygen of the air with which hydrogen has combined. Hence oxygen and hydrogen are the constituents of water. Combination of oxygen and hydrogen with explosion to form water. If by measure there be twice as much hydrogen as oxygen, or by weight eight times as much oxygen as hydrogen, then no gas remains—all becomes water. All water composed of these two bodies in this proportion. These two bodies can then be separated from water and can be made to unite, and form water. In all cases of chemical combination bodies are united in constant proportion.

Experiments.—Illustrate the characteristic properties of ice, water and steam. Show that equal volumes of hot and cold water do not counterbalance one another. Fill a flask to the bottom of the neck with cold water, and then heat to show expansion of the water. Show current by heating a large flask of water. To illustrate distillation distil water containing copper sulphate. Show Liebig's or other forms of condensers. Show the mode of determining the boiling point of a liquid. Show that the temperature remains constant and that on dissolving substances in water the boiling point is raised. To show the presence of hydrogen in water, pass steam through a red-hot iron tube filled with coarse iron turnings or nails. Note the change in the iron both in appearance and weight. This increase of weight and the weight of gas which comes off equals weight of steam which has been decomposed. Hence two substances in water, one the combustible gas that comes through the tube, the other the body which remains with the iron. Collect the hydrogen over cold water in proof that it is not steam, also show that it burns. Explode a mixture of two volumes of hydrogen and one volume of oxygen. Plunge a burning taper into jar of hydrogen held mouth downwards, to show burning of the gas and extinction of the taper. Show by a balloon or soap bubbles, or inverted beaker glass suspended from a balance, that hydrogen is lighter than air. Condense the water formed by the burning of a jet of hydrogen.

CARBON.—Charcoal, graphite, or black lead and diamond. When wood sugar, meat, or bread are heated carbon remains. Charcoal not changed in

the air at ordinary temperatures. Combination of carbon with the oxygen of the air at a red heat. Carbon dioxide a compound of carbon and oxygen. Chemical combination of carbon and oxygen is attended by the evolution of a definite amount of heat expressed by amount of water it will heat. Combustion. The properties of carbon dioxide. Water dissolves carbon dioxide at ordinary temperatures. Action of carbon dioxide on lime-water; no animal can live in this gas. 100 parts of carbon dioxide are composed of 27·27 parts of carbon and 72·73 parts of oxygen. Carbon dioxide obtained from marble, limestone, oyster-shells, chalk, &c. Charcoal fire. Coal composed of carbon, hydrogen, and a little oxygen, &c.; its burning is the result of the carbon and the hydrogen combining with oxygen. Whenever oil, tallow, or coal gas is burnt carbon dioxide and oxide of hydrogen (water) are formed. Respiration produces similar changes. In expired air the same products arise as from the burning of the food, and there is the same evolution of heat. Carbon a constituent of all animal and vegetable bodies.

Experiments.—Specimens of charcoal. Make charcoal by heating wood in a test-tube provided with a cork and delivery tube. The blacklead of a pencil as a specimen of graphite. Show that acids and alkalies do not change charcoal, but that when heated it soon burns away, and only ash is left. Take a small piece of charcoal in a glass tube, pass air over it into lime water, and show no change takes place until the charcoal is made red hot; as the charcoal disappears the lime water becomes milky. Prepare carbonic acid gas by acting on marble with dilute acid. Show by means of the balance, or by soap bubbles, or by passing it from one vessel to another, that carbon dioxide is heavier than air, that it acts on lime water, that a burning candle is extinguished in it. Its solubility in water shown by agitating a tube of the gas over water. Collect all the gas given off from a small piece of marble weighing 1 or 2 grammes. Show by collecting in inverted beaker the products of combustion of a candle, of a lamp, and of a gas flame, and adding lime water, that carbon dioxide is given off. Show also by means of lime water that respired air contains this gas.

Sulphur.—Known also as brimstone. Where found. Its properties. Is also found chemically combined with many metals, so not recognisable by the eye. Sulphur heated in the air melts; more strongly heated it burns, then the sulphur disappears; the strong smell produced belongs to a new body formed by the burning; this new body is a compound of sulphur and oxygen. Gaseous properties of the new body, its effect on blue litmus paper, which oxygen and sulphur have not. Its composition is 50·00 parts of sulphur and 50·00 parts of oxygen, and it is called sulphur dioxide. Water dissolves nearly fifty times its volume of this gas, and then turns blue litmus strongly red and has an acid taste. The combination of the gas with water to form sulphurous acid. Another compound of sulphur and oxygen can be made, in which the same weight of sulphur is combined with more oxygen. One hundred parts contain 40 of sulphur and 60 of oxygen, and it is called sulphur trioxide. Sulphur trioxide has properties differing from the dioxide. If the dioxide and oxygen be mixed they do not combine, but if they are passed together over hot platinised asbestos dense white fumes are formed, which are the trioxide. Combination of the trioxide with water to form sulphuric acid (oil of vitriol).

Experiments.—Show roll and flowers of sulphur and specimen of native sulphur, also iron pyrites and other native sulphides. Powder iron pyrites and heat the powder in a test-tube held horizontally over a lamp to show the sulphur obtained from the pyrites. Show the melting of sulphur by heating flowers of sulphur in small flask.

Heat sulphur on a piece of tin plate till it catches fire, show the colour of the flame and observe the smell of burning sulphur. Prepare sulphur dioxide by heating copper turnings in strong sulphuric acid, and show that it extinguishes flame, is very soluble in water, and that the water dissolving it becomes very acid, turning blue litmus red. Bubble air through a strong solution of sulphur dioxide, and then over platinised

asbestos; demonstrate that when the platinised asbestos is hot dense white fumes are formed which consist of sulphur trioxide. Pour some sulphuric acid into 20 or 30 times its volume of water and prove its acid taste, its action on litmus, and its power of causing effervescence if dropped on sodium carbonate. Show that sulphuric acid is a colourless liquid, that bulk for bulk it is more than $1\frac{3}{4}$ times the weight of water. Show by a thermometer or by immersing a test tube with spirit in it that a large amount of heat is evolved when this acid is poured into water. Pour some sulphuric acid on sugar or shake it up with oil to show its action on organic bodies.

Chlorine.—The gas obtained by the action of hydrochloric acid on the black oxide of manganese. So called on account of its colour. Its characteristic smell. Is $2\frac{1}{2}$ times as heavy as air and $35\frac{1}{2}$ times as heavy as hydrogen. Soluble in water. Many substances take fire in chlorine gas, *e.g.*, phosphorus, and form chlorides. Ignition of oil of turpentine in chlorine with separation of carbon and formation of hydrochloric acid. Bleaching power of chlorine. Bleaching-powder.

Experiments.—Samples of common salt, rock-salt. Prepare chlorine from (1) mixture of common salt, black oxide of manganese and sulphuric acid; (2) from mixture of black oxide of manganese and hydrochloric acid. Collect gas by downward displacement. Draw attention to its colour, and show that phosphorus spontaneously inflames in the gas to form chemical compound of phosphorus and chlorine. Show that oil of turpentine ignites spontaneously in chlorine. Show that sodium when strongly heated and immersed in a jar of chlorine burns and forms common salt. Show bleaching action of chlorine by dipping moistened Turkey red rag in bottle filled with gas. Show similar action with solution of bleaching-powder and acid. Show that chlorine is soluble in water and that the solution has characteristic smell and colour of the gas.

Acids.—Are bodies which have sour taste, turn blue litmus red, and liberate carbon dioxide when added to solution of sodium carbonate. Sulphuric acid has these properties. There are two other common bodies which have strong acid properties like sulphuric acid, these are nitric acid and hydrochloric or muriatic acid; these contain different constituents from sulphuric acid. All act on litmus, &c. in same way; all can be neutralised by potash forming potassium sulphate, or nitrate, or chloride. The compound formed by the interaction of an acid and an alkali is called a salt. Water is always formed at the same time. All three acids are colourless liquids, but, beside the properties possessed by all acids, each acid has properties which belong to it alone. Nitric acid attacks most metals. Poured on copper the metal is dissolved and red fumes are formed. Hydrochloric acid does not dissolve copper, is not so heavy as sulphuric acid; when mixed with manganese dioxide and warmed a yellow irrespirable gas known as chlorine is given off.

Experiments.—Samples of nitric and hydrochloric acids. Show that both have all the properties belonging to acids, and that by neutralising them with potash and soda respectively nitre and common salt can be made. Show the action of nitric acid on copper, tin foil, &c. Show that it has no action on platinum or on gold. Copper placed in hydrochloric acid not attacked, but if mixed with manganese dioxide and warmed chlorine is given off.

Alkalies.—Are bodies which turn red litmus blue; have soapy taste and absorb carbon dioxide. If potash be added gradually to sulphuric acid the properties of both gradually disappear, and at last a liquid is obtained that has no action on litmus. This result of this combination of acid and alkali is sulphate of potash or potassium sulphate; sulphate of soda or sulphate of ammonia can be formed in a similar manner.

Experiments.—Show that solutions of potash, soda, and ammonia turn reddened litmus blue, and that when a tube containing carbon dioxide is inverted in any of these solutions the gas is absorbed. Add gradually

to dilute sulphuric acid one of these bodies, and see that the acid character of the dilute sulphuric acid disappears. Neutralise exactly sulphuric acid with potash, then evaporate and crystallise out the salt formed.

AMMONIA.—A gas with a very pungent smell. Solution in water. One volume of water dissolves 800 volumes of ammonia. This liquid has the pungent smell of the gas, and it can neutralise the strongest acids. Formation of ammonium chloride or sal ammoniac by ammonia with hydrochloric acid Ammonium chloride a white solid, soluble in water, with no smell of ammonia. Ammonium chloride a volatile body. The effect of boiling a solution of ammonium chloride with lime or potash. Ammonia is composed of 82·3 parts of nitrogen and 17·7 parts of hydrogen. The pungent odour of smelling salts is due to ammonia. Animal matters, such as horn, dried flesh, glue, cheese, isinglass, heated so as to decompose these bodies, yield ammonia. The formation of ammonia in large quantities by heating coal to make coal gas. Production of ammonia when animal matters containing nitrogen putrefy.

Experiments.—Prepare ammonia by treating ammonium chloride with an equal weight of slaked lime and enough water to make the whole into a thick mud: and demonstrate its smell, its action on red litmus, and its great solubility in water. The gas passed into water, the increase of volume of the liquid. Its properties and their identity with those of the gas. Volatility of ammonia shown by the liquid leaving no residue on evaporation. Show that ammonium chloride is formed by neutralising a solution of ammonia with hydrochloric acid, and is obtained as a solid on evaporation, and that on further heating it is volatilised. Heat coal in a coarse powder in a test-tube provided with a cork and delivery tube, and show that the liquid obtained is very alkaline. Show the formation of ammonia by the addition of potash and lime to a solution of ammonium chloride.

LIME AND CLAY.—Limestone, marble, oyster-shells, and chalk, all contain a metal known as calcium. The oxide of this metal known as lime. Lime and carbon dioxide are together present in limestone, marble, shells, and chalk. When these are strongly heated, especially in a current of air, the carbon dioxide is evolved and the lime is left. Action of water on lime. Use of lime in making mortar. Lime slightly soluble in water. On blowing carbon dioxide into a clear solution of lime (lime-water), liquid becomes turbid, owing to combination of carbon dioxide and lime to form chalk. Same effect on breathing through lime-water. Other important salts of lime are gypsum or plaster of Paris (sulphate of lime) and phosphate of lime, which latter exists largely in bone. Clay is a combination of a body called silica, which is the chief constituent of sand and flint, with the oxide of a metal known as aluminium, so called because it exists also in alum. Glass is a compound of silica with lime and an alkali, potash or soda. Varieties of clay; their use in manufacture of bricks and pots. The metal contained in clay (aluminium), a white body with a brilliant lustre, 2½ times as heavy as water; may be rolled out into thin sheets and drawn into fine wire. Not oxidised in the air.

Experiments.—Samples of limestone, marble, oyster shells. Show that these substances effervesce with dilute hydrochloric acid, and that a gas carbon dioxide is evolved. Heat a piece of limestone or marble to redness in a fire, and show that after heating it no longer gives off carbon dioxide on treatment with an acid. Describe process of lime-burning. Properties of lime as distinguished from limestone. Show that a piece of moistened red litmus paper pressed against limestone is not affected, but that when pressed against lime it is turned blue. Show slacking of lime; draw attention to heat evolved. No such result on treating limestone with water. Show that lime is soluble in water, whereas limestone is not. Add carbon dioxide to the solution of lime, and show that white powder is formed which on treatment with acid evolves carbon

dioxide again. Explain that white powder thus formed is identical in chemical composition with limestone, and hence that limestone is a compound of carbon dioxide and lime. Show plasticity of clay and exhibit one or two specimens of ware before being baked. Show that a vessel of kneaded or "puddled" clay will hold water. Explain chemical nature of clay, and show specimens of silica and alumina. Show alum and demonstrate that alumina is contained in it by heating ammonia alum. Show specimen of aluminium and explain that this metal is contained in alumina and therefore in clay.

METALS, INTRODUCTORY.—About 70 different elementary substances known. All the common metals are elements. For instance, iron, lead, copper, zinc, mercury, silver, gold, tin, are elements. All combine with oxygen to form oxides, with chlorine to form chlorides, and with sulphur to form sulphides. Metals combine with one another to form alloys, for example, brass, bronze, gold and silver coins, pewter, solder. Alloys which contain mercury are called amalgams.

Experiment.—Specimens of metallic and non-metallic elements and of oxides and sulphides.

LEAD.—Its colour; a fresh surface bright, but soon tarnishes in the air. Lead is 11½ times as heavy as water. Can be beaten or rolled into thin sheet or drawn into wire. Melts at temperature 633° F. Can be cast in a mould. Its combination when liquid with oxygen. Formation of lead oxide. The oxide has entirely different properties from lead. Removal of the oxygen when heated with carbon and the formation of metallic lead. Formation of red lead by heating the oxide. Solution of lead by nitric acid and the formation of lead nitrate. Solution of lead oxide by nitric acid and the formation of lead nitrate, which, like potassium nitrate, is termed "a salt." Its solution in water. Other salts of lead, chloride, sulphate. Formation of sulphate and chloride of lead, their insolubility in cold water. Galena, or lead sulphide, one of the ores from which lead is obtained.

Experiments.—Piece of lead to scrape and show it is then bright and has "metallic" appearance. Show by balance that compared with water it is bulk for bulk much heavier. Show the metal beaten out into thin sheet, also as wire. Melt lead in an iron spoon, and cast in a mould. Show formation of oxide by blowing air on to the melted metal. Contrast the properties of the oxide with those of the metal. Convert the oxide again into metal by strongly heating an intimate mixture of it and charcoal powder. Heat the oxide to show its further oxidation and the formation of red lead. This oxidation is hastened by adding a little chlorate of potash. Show the action of nitric acid on lead, also on lead oxide, and the formation of lead nitrate. Show this is "a salt," and prove that it is soluble in water. Demonstrate that lead is very slightly soluble, and lead oxide almost insoluble in water. Show the formation of chloride and sulphate of lead by the addition of the respective acids to a solution of lead nitrate. Collect on filter the salts so formed, wash and dry them. Show specimen of Galena (lead sulphide).

IRON.—Three kinds of iron; wrought iron, cast iron, and steel. Wrought iron nearly pure and used if the body is to be formed by hammering. Cast iron contains most carbon. Steel used for cutting instruments; can be made into a magnet; can be "annealed." Solubility of all three forms of iron in sulphuric, nitric, and in hydrochloric acids, and the formation of iron sulphate, nitrate, and chloride. Their solubility in water. Melting point of iron is at much higher temperature than that of lead. Comparison of the weight of iron with that of water. Its colour. The ready action of moist air *containing carbonic acid* on it. Formation of rust. Oxidation by heating. The action of steam on iron when red hot. Oxide of iron heated with hydrogen or with carbon parts with its oxygen, and iron is left. Oxide of iron found in the earth. Hæmatite. Clay iron stone, a carbonate of iron mixed with clay used as a source of iron. By heating the ore oxide of iron is

obtained. Removal of the oxygen by heating it to a very high temperature with carbon. Formation of slag from clay and lime.

Experiments.—Specimens of the different kinds of iron, wrought iron, cast iron, and steel. Dissolve grey cast iron in hydrochloric acid diluted with equal volume of water, show carbon which remains, filter and evaporate the liquid to show the chloride of iron formed. Heat iron wire by the blowpipe to show the high temperature required to fuse it. Iron acted on by air and moisture to show its rusting. Heat iron oxide in a tube and pass hydrogen over it to show formation of water and metallic iron. Show specimens of iron ores, clay iron stone, hæmatite, magnetic iron ore, and slag.

Copper.—Its colour. Does not rust in air at ordinary temperatures. Thin wire melts in flame of Bunsen burner. When heated in air becomes black, owing to formation of an oxide. Oxide heated in hydrogen gas yields up its oxygen, water is formed, and the red-coloured copper is obtained. Action of acids on copper. With dilute nitric acid evolves a colourless gas, which turns red in contact with the air, and the metal dissolves, forming a blue solution of copper nitrate. Heated with sulphuric acid copper yields sulphur dioxide, the same gas which is formed when sulphur burns in air or in oxygen. The substance formed when copper dissolves in sulphuric acid is copper sulphate. When crystallised from water has a fine blue colour, and known as blue vitriol. Action of vegetable acids on copper. Verdigris. Use of copper in alloys. A penny composed of 95 parts of copper, 4 parts of tin, and 1 part of zinc. Bell metal and gun metal contain copper and tin.

Experiments.—Show specimens of copper in bar, sheet, and wire. Point out characteristic colour of metal. Heat piece of sheet copper over flame of Bunsen burner. Show formation of black film. Explain its origin. Take black oxide of copper and heat in hydrogen gas. Show that metal is again formed and that water is produced. Show action of nitric and sulphuric acids upon copper. Exhibit specimen of copper sulphate (blue vitriol). Show that on placing a knife blade in a solution of copper sulphate metallic copper is deposited on the steel. Show sample of verdigris and explain how formed. Show various alloys of copper, bell-metal; brass, gunmetal, &c., a penny-piece.

Mercury.—A liquid metal, but if it be cooled to −40° Fahrenheit it is solid. Its metallic appearance. Its weight; heaviest liquid known; 13·6 times as heavy as water. Use in the barometer and thermometer. Does not rust or tarnish in the air at ordinary temperatures, oxidises if heated to about 600° F. in the air, and forms red mercuric oxide. Is readily attacked and dissolved by nitric acid. It dissolves many metals,—*e.g.*, tin, lead, &c.; amalgams. Mercury in combination with sulphur, as cinnabar. Mercury can be obtained from any salt of mercury by heat, volatilization of mercury, and the condensation of the vapour.

Experiments.—Specimen of mercury. Show that to balance one volume of mercury 13⅔ volumes of water are necessary. Boil a little mercury in a test-tube to show it vaporizes. Treat mercury with nitric acid and show its solution. Show that tin foil is dissolved by mercury, which latter becomes less fluid. Heat mercuric oxide in a test-tube provided with cork and delivery tube and collect both the oxygen and the mercury. Heat mercuric chloride in tube sealed at one end with dry sodium carbonate and show the metallic mercury condensed on the sides of the tube.

Sodium.—Common salt contains a metal combined with chlorine known as sodium. 100 parts of common salt contain 39·3 parts of Sodium and 60·7 parts of Chlorine. Carbonate of soda (washing soda) contains sodium. Sodium obtained on strongly heating carbonate of soda with charcoal. Sodium one of the lightest solids known. Swims on the surface of water and decomposes that liquid with evolution of hydrogen and formation of the alkali soda. Other properties of the metal sodium: its low fusibility and softness. Its

tarnishing in air. Preservation of sodium from action of air by being kept in some liquid lighter than water and free from oxygen.

Experiments.—Samples of common salt and rock salt; also washing soda and bicarbonate of soda. Recall experiment showing that chlorine is constituent of common salt. Show that washing soda and sodium bicarbonate evolve carbon dioxide on treatment with an acid. Exhibit specimen of sodium. Show that it can be cut with a knife, and that the two portions can be pressed together again so as to form one piece. Exhibit metallic lustre of sodium; show that it quickly tarnishes in the air. Show that sodium is lighter than water and decomposes that liquid with evolution of gas (hydrogen). Collect hydrogen from water by thrusting small piece of sodium beneath test-tube filled with water and standing in basin of water.

Carbon Compounds.—Large numbers of substances are met with in plants and animals which are not found in the earth. Most of these bodies contain carbon. The other elements united with the carbon are hydrogen, oxygen, nitrogen; some bodies are composed of all these elements; others of only two of them. Many of these bodies when heated leave a black residue of carbon; when this is more strongly heated it burns away. The great number of these carbon compounds, and the great difference in their properties. Some are acids, *e.g.*, vinegar (acetic acid), and tartaric acid. Some are salts, *e.g.*, fats, tallow, butter. Some are neutral bodies, *e.g.*, sugar, starch, spirit.

Experiment.—Show that on heating any ordinary vegetable or animal substance carbon is left behind, and that all on being burnt in oxygen give carbon dioxide the formation of which proves the presence of carbon.

Acetic Acid.—One form of dilute acetic acid is known as vinegar. Formation of acetic acid when beer or wine exposed to the air becomes sour. The spirit present combines with oxygen of the air and forms acetic acid. The presence of a kind of fungus called mycoderma aceti necessary to cause this oxidation. Large amount of vinegar is made from poor kinds of wine and beer. Action of vinegar on blue litmus, and on sodium carbonate. Acetic acid is made by heating wood in a retort; a great many bodies distil over, among them acetic acid. The pure acid has a very pungent smell, and has all the properties which are characteristic of the acids. Boils at 246° F. Dissolves in water. It is composed of carbon, hydrogen, and oxygen in the proportion of 40·0 parts of carbon, 6·7 parts of hydrogen, and 53·3 parts of oxygen. It is, like sulphuric acid, neutralised by alkalies. Iron put into it is slowly dissolved, hydrogen being given off. Oxide of lead dissolves in it, forming a salt, and if the clear solution be evaporated a white crystalline body called "sugar of lead" is formed, which is lead acetate. The vinegar smell belongs only to the acid not to the salts. Sodium acetate has no smell; add to it sulphuric acid and warm, when the smell shows the acid has been formed and that it is volatile.

Experiments.—Show that vinegar has the properties of an acid, and that a salt is formed on neutralising it. Show a specimen of the commercial acetic acid, and point out its colourless appearance and strong smell and acid reaction. Show that iron is acted on and dissolved by acetic acid. Make sugar of lead by dissolving lead oxide in acetic acid, and crystallise out the salt. Point out disappearance of the pungent odour of the acid on neutralisation by potash or soda. Demonstrate the formation of the acid as indicated by the odour on addition of sulphuric acid to sodium acetate, and show that it can be separated from the liquid by distillation.

Tartaric Acid.—Occurs in many fruits, especially in grapes. Is obtained from "argol," an impure potassium salt of tartaric acid, deposited when grape juice ferments. Tartaric acid is a crystalline solid, and dissolves easily in water. Has no smell. Is composed of carbon, hydrogen, and oxygen, *i.e.*, the same elements as are in acetic acid but in different proportions, viz.:—

32·0 parts of carbon, 4·0 parts of hydrogen, and 64·0 parts of oxygen. Its action on sodium carbonate. Effervescing draughts; seidlitz powders. Tartrates.

Experiments.—Specimen of argol and of crystals of tartaric acid. Show solubility of the solid acid in waters and that the solution has acid properties and is without odour. Demonstrate the presence of carbon in the acid by ignition.

Fat and Oils.—Are neutral bodies having a constitution similar to that of a salt. All common fats and oils yield glycerine which corresponds to the base, but the acid they yield varies in different cases. They are all insoluble in water. Oils are liquid; fats are solid. Many of the oils are obtained from vegetables, either from the seed or fruit. Most of the fats are from animals. Melting of tallow (fat of the ox, sheep, &c.) put in boiling water. Its non-solution in water. Its lightness as compared with water. If fat be boiled with a solution of caustic potash, the liquid becomes slightly milky, and nearly the whole of the fat gradually dissolves with formation of potassium stearate and glycerine. To the solution of potassium stearate hydrochloric acid is added. Potassium chloride is formed and stearic acid, which, as it cannot dissolve in water, separates out. Stearic acid dissolves in alcohol and in ether and separates out in crystals on evaporation. Used in making candles, and is better than tallow because it melts at a higher temperature. Tallow distilled with steam of temperature 600° F. (superheated steam) yields stearic acid and glycerine, and when cold these bodies remain separate. All oils and fats are decomposed by potash in the same way as tallow.

Experiments.—Tie beef or mutton fat up in muslin bag, and melt in boiling water to separate the fat from membraneous matter. Show that fat is insoluble in water, that it floats on water, and melts at a temperature below boiling water. Show that oil has very similar properties to melted fat. Boil oil or fat with caustic potash. Prepare a solution of potassium stearate, and precipitate stearic acid from it by the addition of hydrochloric acid. Show the solubility of the acid in alcohol and ether, and the insolubility of the lime salt of stearic acid.

Glycerine.—A thick colourless liquid with a sweet taste. Dissolves readily in water. When quite pure becomes solid at a low temperature. If heated alone it is destroyed, but if heated with water in a retort it distils over with the steam. Heated with acids it reacts slowly with them, and bodies similar to fats are formed together with water.

Experiment.—Specimen of glycerine. Demonstrate its solubility in water, its sweet taste, and power of dissolving many salts and other substances even more freely than water.

Soap.—By boiling fat with caustic soda sodium stearate is formed. On adding salt or excess of soda to the liquid the sodium stearate, which is soap, separates out as a curdy mass. Soft soap is potassium stearate. Action of soap in washing. Action of soap on hard and on soft waters.

Experiment.—Shake distilled water up in bottle with soap. Show action of solutions of salts and acids on the solution. Add soap solution to distilled water, also to common water, and explain the difference of action. Show the production of fatty acid from soap by adding hydrochloric acid to a solution of soap.

Sugar.—Exists in many plants. Is obtained from the sugar cane; also from beet root. The juice of these plants yields the sugar. When pure it is white, crystalline, sweet, and very soluble in water. Sugar candy. If heated with very little water to 365° F., on cooling it is no longer crystalline and is "barley sugar." Does not combine with acids, but even a very little acid boiled for a long time with a solution of sugar changes it to another kind of sugar. Composition of cane sugar. The several different kinds of sugar, *e.g.*, the solid part of honey is a sugar which differs from the sugar in

the sugar cane; the same found in all sweet fruits and is called grape sugar. Grape sugar not so sweet nor so soluble as cane sugar.

Experiment.—Specimens of ordinary white and brown sugar; also sugar candy and barley sugar. Show its great solubility in water; also that its solution is neutral. Heat white sugar and draw attention to the peculiar odour of the products of decomposition, and show that on further heating it leaves a residue of carbon. Wash honey with spirit, and show that the residue is a kind of sugar, but that it is not so sweet as ordinary sugar and not so soluble.

STARCH.—A neutral substance, composed of carbon, hydrogen, and oxygen. Composition. Peculiar structure; not crystalline. Is found in all parts of a plant. Is obtained from wheat, rice, potatoes, arrowroot, &c. Starch in its ordinary condition insoluble in cold water. When starch powder is boiled with water the starch is partially dissolved. Strong solutions form a jelly when cold. Used for stiffening linen. Starch recognised by its forming a blue compound with iodine. Undergoes no change in the air at ordinary temperatures; if heated to about 300° F. it becomes slightly discoloured and is changed into a soluble body, known as British gum (dextrin). If small amount of nitric or hydrochloric acid be added to the starch this change is more rapid. Extract of malt also changes starch into soluble compounds. Starch as a food.

Experiment.—Specimen of starch, show by the microscope its peculiar structure and absence of crystalline form. Demonstrate that it does not dissolve in cold water, but on boiling some does dissolve. Show that starch both solid and in solution gives a blue colour when iodine is added to it. Moisten starch with very dilute hydrochloric acid, and heat to convert it into a gum, which is thus soluble in water.

GLUTEN.—If flour is tied up in a muslin bag and well kneaded in a basin of water, the water becomes milky, and on standing starch sinks to the bottom. All the starch in the flour can be thus removed, and then a sticky substance remains in the bag called gluten. About 70 per cent. of flour is starch and 10 per cent. is gluten. Gluten contains nitrogen, starch does not. These bodies represent two most important constituents of food. The gluten exposed to the air soon decomposes and smells very disagreeable (putrefies).

Experiment.—Tie some flour up in a piece of muslin and knead it for some time in a basin of water; the starch comes through and will settle to the bottom of the vessel and can be collected and examined; the gluten remains in the bag. Heat some flour in a porcelain dish first in an oven where it turns brown, then more strongly over a flame. It blackens and yields a smell somewhat like burnt sugar while a mass of carbon remains. Place a lump of this on a piece of platinum foil and heat till the carbon is burnt off. A small white ash consisting chiefly of potassium phosphate remains.

SPIRIT.—Alcohol, spirits of wine. A colourless, light liquid. Neutral to test papers. Has pleasant odour, boils at 173° F. Burns with a flame, which gives very little light, without leaving any black residue of carbon. Sugar, camphor, and many other substances, but few salts, dissolve in it. It is the intoxicating principle in wines and spirits. In beer there is 3 to 5 per cent. of alcohol. In light wines about 8 per cent. In spirits 60 to 75 per cent. The different flavours of wines and spirits depend on very small quantities of other bodies present. Alcohol dissolves in water, giving out heat.

"Proof spirit" contains 50·76 parts of water, and 49·24 parts of alcohol. If more water be present the spirit will not set fire to gunpowder when burning. Alcohol obtained from grape sugar. Fermentation grape sugar converted into alcohol and carbon dioxide by presence of some ferment such as yeast. Cane sugar on the addition of yeast is first converted into grape sugar, then into alcohol and carbon dioxide. Use of yeast in brewing. Yeast not necessary for making wine as there is already a ferment in expressed juice of grape.

Experiment.—Show it is neutral liquid dissolving in water, that it burns with nearly colourless flame, and leaves no residue of carbon. Show that it can be made to boil at much lower temperature than water by placing test-tube of it in hot water. Distil beer and collect the alcohol and water which comes over; add quicklime to this. Allow it to stand some hours and distil again. Show that this is much stronger, catches fire readily, and tastes more burning. Make a solution of common sugar in a large flask; add yeast, and fit a cork with a bent tube to the flask. Let the tube dip into lime water. Place it in a warm place, and after some days show that spirit has been formed in the flask by distilling the liquid and collecting the portion coming over first.

All the substances and experiments mentioned above are to be shown to the class. This does not preclude such other experiments and illustrations as may suggest themselves to the teacher.

Second Stage or Advanced Course.

In addition to the subjects of the first syllabus of the elementary course (p. 1) students presenting themselves for the advanced examination will be assumed to have received instruction in the following:—

The experimental methods by which the composition of the following bodies has been accurately determined:—water, atmospheric air, hydrochloric acid, ammonia, the gaseous oxides of nitrogen, the oxides of carbon, sulphuretted hydrogen.

Laws of gaseous combination of elements and compounds. Reduction of gaseous volumes to standard pressure and temperature. Calculation of quantities by volume and by weight.

Atoms and molecules, atomic and molecular weights. Law of Avogadro. Atomic and molecular formulæ and equations. Specific heat and atomic heat of the elements. Graphic or constitutional formulæ. Atomic value or valency of the elements. Phenomena of dissociation. Classification of the elements.

Water.—Causes of permanent and temporary hardness in. Modes of softening. Suitability for domestic purposes. Determination of composition of water by weight and by volume.

Hydrogen Dioxide.—Its preparation and properties.

Ozone.—Production, properties and constitution. Occurrence in nature.

Atmospheric Air.—Mode of ascertaining exact composition of. Carbon dioxide, amount contained in, and determination of. Aqueous vapour, determination of.

Chlorine.—Theory of bleaching. Composition and preparation of bleaching powder. Oxides and the following oxy-acids of chlorine, viz.:—Hypochlorous, chloric and perchloric acids, preparation, properties, and composition of.

Bromine, and hydrobromic and bromic acids.

Iodine, and hydriodic, iodic, and periodic acids.

Fluorine.—Hydrofluoric acid.

Phosphorus, its sources and its allotropic modifications; its hydrides, chlorides, and oxides. Phosphoric acids and the phosphates. Hypophosphorous and phosphorous acids.

Arsenic, and its hydrides, chlorides, and oxides. Arsenious, and arsenic acids. Arsenites and arsenates. Detection of arsenic.

Antimony and Bismuth.—Hydride, chloride and oxides of antimony, chloride, oxides and salts of bismuth to be studied chiefly with the object of showing the relations of these two elements to the members of the phosphorus group.

Boron, its occurrence and allotropic modifications. Boron trioxide. Boric acid.

Silicon, and silica. Silicic acid. Silicon hydride, silicon fluoride. Names and formulæ of some of the more important silicates (mineral).

The chief properties of the following metals, and the composition and properties of their *more important* compounds. Potassium, sodium, ammonium, silver, mercury, copper, zinc, cadmium, magnesium, barium, strontium, calcium, tin, gold, aluminium, platinum, lead, chromium, manganese, iron, cobalt, and nickel.

The processes of formation and crystallisation of the chief salts of these metals should be practically demonstrated, and specimens should be prepared by the students.

Manufacturing processes for the production of—

Oxygen.	Iron and steel.
Chlorine, bromine, iodine.	Copper.
Bleaching powder.	Lead.
Sulphuric acid.	Mercury.
Hydrochloric acid.	Silver and gold.
Nitric acid.	Zinc.
Sodium carbonate and caustic soda.	Aluminium.
Lime.	Sodium.

Honours.

In addition to the above subjects, candidates for honours are expected to possess a knowledge of the following subjects :—

The properties of all the elementary bodies and their more important combinations, including compounds of metals with hydrocarbon radicles.

Classification of the elements. Relations between atomic weight and physical and chemical characters.

The thermal phenomena of chemical combination. Theory of flame. Cause of luminosity. Principles of spectrum analysis as applied to the determination of the composition of terrestrial matter. Dissociation. Diffusion of gases. Laws of electrolysis. Theories relating to solutions. History of the development of chemical science, *excluding modern Organic Chemistry*, from the time of Boyle to the present day.

The candidates will also be expected to show a satisfactory acquaintance with current chemical literature.

Note.—No candidate who does not pass the practical as well as the theoretical examination can obtain a medal or certificate in Honours. See Science sec. 46 & 48, p. 40.

SUBJECT X. *p*.—INORGANIC CHEMISTRY, PRACTICAL.

First Stage or Elementary Course.

The practical knowledge of the candidate will in this stage be tested both by a written and a practical examination.

I. The subjects of the written examination will include—

(*a*.) The preparation of the elements and compounds enumerated in the elementary course of Subject X., (Theoretical,) and the methods of experimentally demonstrating their properties.

(*b.*) The principal reactions, both wet and dry, of the following: lead, copper, iron, zinc, calcium, potassium, ammonium, carbonates, nitrates, sulphates, chlorides.

These questions will, as much as possible, be so framed as to prevent answers being given by students who have obtained their information merely from books and oral instruction. Any student on whom it is intended to claim payments in this stage may be called on by the inspector of the Department, when visiting the Laboratory, to repeat some of the experiments which he has had the opportunity of witnessing.

The value of the answers will be greatly enhanced by the neatness and clearness of the sketches; provided always, that an accurate knowledge of the construction of the apparatus is exhibited.

II. The practical examination may consist of exercises selected from any of the following divisions of experimental work:—

A. Testing of two powders neither of which will contain more than two metallic and one acid radicle from the above list. The powders will be soluble in water or in dilute acid.

The experiments made must be carefully described, and the analytical results clearly stated and confirmed by more than one reaction.

No notes, books, or analytical tables may be consulted during the examination.

B.—Carrying out experiments for which printed instructions will be given in the paper, *e.g.*, the observation of the effects of heat or of water, or acids, &c. upon the materials supplied. If a gas is evolved, the candidate may be required to determine what it is. [Such a gas will always be one of those referred to under Subject X., First Stage, and of which the properties have been demonstrated in the lectures.]

C.—Recognition of materials which have been exhibited upon the lecture table, and the properties of which have been demonstrated, *e.g.*, sulphur, iodine, charcoal, manganese dioxide, potassium chlorate, nitre, sal-ammoniac, &c.

D.—Quantitative experiments of a simple kind, *e.g.*, a metal or a salt may be supplied to be weighed, dissolved in acid, and the amount of evolved gas measured at the temperature of the laboratory. Or the carbon dioxide in a carbonate may be estimated by solution in an acid, and observation of the loss of weight. Or determination of the weight of one metal, such as silver, which can be displaced by another, such as magnesium. Or experiments on the neutralisation of acids or alkalis.

Second Stage or Advanced Course.

The examination will consist of two parts:—

I. A short written examination of about four questions, with the object of testing the candidate's knowledge of the theory of ordinary methods of qualitative analysis and the preparation of such bodies as are enumerated in Second Stage, Subject X.

II. A practical examination, in qualitative and very simple quantitative analysis. One or two substances for qualitative analysis, each containing not more than four salt radicles, positive or negative, selected from the following list: silver, lead, mercury, copper, bismuth, cadmium, tin, arsenic, antimony, iron, manganese, aluminium, chromium, zinc, cobalt, nickel, calcium, strontium, barium, magnesium, potassium, sodium, ammonium, oxides, hydroxides, chlorides, bromides, iodides, fluorides, sulphides, sulphites, sulphates, chromates, carbonates, phosphates, arsenates, borates, nitrates, nitrites, chlorates, permanganates.

There might, therefore, be four metals in the form of oxide, or three metals in the form of the same salt, or two simple salts or one metal in the form of three salts.

One substance may be given to be tested quantitatively by means of a previously prepared volumetric solution.

The remarks with respect to inspection made in the Elementary Stage apply also to this grade.

Three and a quarter hours will be allowed for the examination in practical analysis and one hour for the written examination.

NOTE.—Candidates will not be allowed to communicate with one another during the examination, but the use of notes or text-books of analysis will be permitted.

HONOURS IN THE YEAR 1896.

The student will be required to have studied the more important methods of quantitative analysis. The examination will consist of two parts:—

I. An examination in qualitative analysis, in which two substances will be given which must be examined for the whole of the radicles contained in the list given in the Advanced Stage (Practical).

II. A practical examination in quantitative analysis, in which the candidate will be expected to show proficiency in the quantitative estimation of the ordinary metals and inorganic acids by gravimetric and volumetric analysis.

The gravimetric analysis should include exercises in the determination of the following metals: silver, lead, mercury, copper, tin, iron, manganese, aluminium, chromium, zinc, cobalt, nickel, calcium, barium, magnesium, potassium, sodium, ammonium; and of the following acids, hydrochloric, hydrobromic, hydriodic, sulphuric, carbonic, phosphoric, nitric, and hydrosulphuric.

The volumetric analysis should include exercises in the ordinary methods of acidimetry and alkalimetry; and use of standard solutions of potassium permanganate, and iodine.

Eight hours will be allowed for the complete examination.

See note at the end of the syllabus for Honours in Subject X., Theoretical.

HONOURS IN THE YEAR 1897.

The student will be required to have studied the more important methods of quantitative analysis. The examination will consist of two parts:—

I. An examination in qualitative analysis, in which substances will be given which must be examined for the whole of the radicles contained in the list given in the Advanced Stage (Practical).

II. A practical examination in quantitative analysis, in which the candidate will be expected to show proficiency in the quantitative estimation of the ordinary metals and inorganic acids by gravimetric and volumetric analysis.

The gravimetric analysis should include exercises in the determination of the following metals: silver, lead, mercury, copper, tin, iron, manganese, aluminium, chromium, zinc, cobalt, nickel, calcium, barium, magnesium, potassium, sodium, ammonium; and of the following acids, hydrochloric, hydrobromic, hydriodic, sulphuric, carbonic, phosphoric, nitric, and hydrosulphuric.

The volumetric analysis should include exercises in the ordinary methods of acidimetry and alkalimetry; and use of standard solutions of potassium permanganate, iodine, sodium thiosulphate, and silver nitrate.

Candidates will also be required to show a practical acquaintance with the methods of calibrating measuring vessels and thermometers, the determination of melting points, boiling points, and vapour densities.

Also with the simpler methods of gas analysis by means of the nitrometer or by the Hempel or Orsat apparatus, or by any modifications of these instruments.

Note.—It should be understood that no candidate can obtain Honours who is not prepared to carry out any observations or experiments commonly practised in the best chemical laboratories.

Three or four days will be allowed for the complete examination. Candidates will not be allowed to communicate with one another during the examination, but they will be allowed the use of note-books or any works of reference they may choose to bring with them.

Where payments are to be claimed on the results of the instruction in Practical Chemistry the school must be provided with a laboratory complying with the following requirements, and a certificate that it does so comply must be given by the committee on page 4 of Form No. 120 (*see* Science *sec.* 18, p. 31). No payments will be made in these subjects unless the laboratory has been passed by the inspector as satisfying completely the conditions laid down below.

These conditions must be considered as the minimum if payments are to be claimed. It is not intended as a complete list of the apparatus or reagents required by students in Honours nor even in the Advanced stage.

Laboratory for Practical Inorganic Chemistry.

The laboratory must be a room or part of a room of a sufficient height to meet sanitary requirements. It must be set apart entirely for the study of Practical Chemistry; it may not be used as a class-room for any other subjects; but it may, when not required for Practical Chemistry, be used as a laboratory for practical work in other experimental sciences. The laboratory and apparatus must, under any circumstances, be kept clean, tidy, and in good order—failing which payments may be reduced or withheld. It must be fitted with one or more properly arranged fume closets, there being one fume closet for every ten benches, and with proper working benches, one of which must be allotted to each student attending the class.* Each bench must be at least 3 ft. 6 ins. wide, and 2 ft. 3 ins. deep; it must be provided with a cupboard and drawers for keeping apparatus, and with a rack or set of shelves for the necessary reagents. Between every two benches there must be a basin and sink with tap and water supply, and gas must be laid on to each bench with nozzles for fixing flexible tubes.

Each bench must be furnished with the following apparatus, which must always be kept in good working order, and when not in use, kept in the drawers and cupboards of the bench.

A Bunsen gas burner, with blow-pipe jet and rose burner.
A test tube stand.
Two dozen test tubes.
Test tube brush.
Mouth blow-pipe.
Piece of iron wire gauze.
Six inches of platinum wire.
Piece of platinum foil.
Set of three small beakers.
A wash bottle.
A box of blue litmus paper.
Retort stand with two rings, or its equivalent.
A tripod stand.
Sand bath.
Crucible tongs.
Spatula.
Two flasks.
One porcelain crucible.
Two porcelain evaporating basins.
Two funnels.
Filter papers.
Triangular and rat-tail files.

Each bench must be supplied with the following chemical reagents kept in proper stoppered bottles on the shelves of the working bench.

Sodium Hydrate.
Sodium Phosphate.
Sodium Carbonate.
Potassium Ferrocyanide.
Ammonium Oxalate.
Ammonium Chloride.
Ammonium Carbonate.
Ammonium Sulphide.
Ammonium Hydrate.
Barium Chloride.
Calcium Sulphate.
Silver Nitrate.
Lead Acetate.
Sulphuric Acid (concentrated).
Sulphuric Acid (dilute).
Nitric Acid (dilute).
Hydrochloric Acid (dilute).
Sulphuretted Hydrogen Solution.
Lime Water.
Borax.
Fusion Mixture.
Ferrous sulphate (crystals).
Manganese Dioxide.
Potassium nitrate.
Lime (powder).

* Drawings and descriptions of fittings for a Chemical Laboratory (Form No. 1013) may be obtained on application to the Department, price 1*s.* 6*d.* [*See* list of publications at end of Directory.]

Apparatus and Reagents for General Use.

A stock of the following apparatus must be kept for the supply of the students.

Test tubes, various sizes.
Boiling tubes.
Soft glass tubing.
Combustion tubing.
Glass rod.
Thistle funnels.
Corks assorted.
Caoutchouc tubing.
Large Berlin porcelain evaporating basin.
Stoppered German glass retorts, various sizes.
Large glass beakers.
Flasks, various sizes.
Gas jars and cylinders.
Burettes to hold 50 *c.c., and stands for the same.*
Balances to carry 100 grams on each pan and turn with 1–2 milligrams; one balance to every six students.

The Laboratory must also be provided with sufficient of the following apparatus for general use.

Wedgwood-ware pestles and mortars.
Iron pestle and mortar.
Cork borers.
Gas or charcoal furnace.
Liebig's condenser.
Sulphuretted Hydrogen apparatus.

One or more sets of the following reagents will also be required for general use.

Sodium Hypochlorite.
Potassium Ferricyanide.
Potassium Chromate.
Potassium Iodide.
Potassium Sulpho-cyanide.
Ammonium Acetate.
Ammonium Molybdate.
Ammonium Sulphate.
Mercuric Chloride.
Platinic Chloride.
Magnesium Sulphate.
Stannous Chloride.
Calcium Chloride.
Cobalt Nitrate.
Ferric Chloride.
Acetic Acid.
Tartaric Acid.
Nitric Acid (concentrated).
Hydrochloric Acid (concentrated).
Sulphurous Acid Solution.
Barium Hydrate.
Alcohol.
Ether.
Hydric Potassic Sulphate.
Potassium Cyanide.
Potassium Chlorate.
Starch.
Microcosmic Salt.
Methylated Spirit.
Charcoal.
Copper Oxide.
Soda Lime.

Where there are students who intend to take Honours in the examination in Practical Chemistry, the following set of apparatus AT LEAST must be provided for every SIX such students.

Two drying ovens.
A water bath.
An agate mortar.
A balance turning with 0·2 milligram.
A platinum evaporating dish.
A platinum crucible.
A nickel evaporating dish.
2 nitrometers.
2 Hempel's gas apparatus or other form.
6 chemical thermometers.
2 Meyer's vapour density apparatus.

Grants in aid of the Supply of Fittings for Laboratories and Lecture Rooms for Science Classes in Ireland.

The following are the Conditions on which My Lords are prepared to make Grants :—

The rooms must be fit for the purposes for which they are to be used; they must be of sufficient height properly lighted and ventilated. Ventilation by windows only is usually not sufficient. There should be means for admitting a supply of fresh air. The extraction of vitiated air is best accomplished by flues reaching to the top of the building.

The rooms must be devoted entirely to Science instruction, and the tenure must be such that the Committee are not liable to be ejected. Satisfactory evidence must be afforded that the class is of a permanent character.

In Laboratories each student should have a working space of at least 3 feet 6 inches by 2 feet 3 inches on the bench-table. Shelves for re-agents, &c. should be fitted above, and drawers and cupboards for apparatus, &c. below the table. Gas should be laid on to each student's bench, and there should be a water tap with an earthenware or lead-lined sink to every two students, if possible. Closets should be provided for evaporation of substances evolving noxious fumes and for sulphuretted hydrogen work. These closets should be ventilated by flues carried up in the wall of the building so as to ensure the extraction of the fumes. Niches with flues should also be provided for combustion furnaces. Further particulars as to fittings will be found in Form No. 1013.

The Laboratory must be a room, or part of a room, of a sufficient height to meet sanitary requirements; it must be set apart entirely for the study of Practical Chemistry or Practical Metallurgy; it may not be used as a class room for any other subjects; but it may, when not required for Practical Chemistry or Practical Metallurgy, be used as a laboratory for practical work in other experimental sciences.

The application for the Grant must be made on a printed Form (Science Form No. 789) to be obtained from the Department, before the fittings are ordered; it must be accompanied by full information on a printed Form No. 789a, which can be obtained from the Department, and must be returned signed by the Chairman and Secretary of the Committee.

When the work has been completed and favourably reported on by an Inspector of the Department, payment of the Grant will be made on receipt of a certificate from the Committee on Science Form No. 790, accompanied by the receipted vouchers.

SUBJECT XI.—ORGANIC CHEMISTRY, THEORETICAL.

THE CHEMISTRY OF CARBON COMPOUNDS.

First Stage.

Peculiarities of the element Carbon which render necessary the separate study of its compounds. Qualitative recognition of carbon, hydrogen, oxygen, nitrogen, the halogens, sulphur and phosphorus in carbon compounds. Methods for their quantitative estimation. Calculation of per-centage composition from the results of analysis and deduction of empirical formulæ. Determination of molecular weights.

Hydrocarbons or *Compounds of Carbon and Hydrogen.*

(1.) Paraffins or $C_n H_{2n+2}$ Series. Marsh gas or methane, ethane, propane, butane, pentane.

Modes of occurrence, preparation and general characters of paraffins. Homology and isomerism.

(2.) Olefine, or $C_n H_{2n}$ Series. Ethylene, propylene, butylene, pentylene.

Modes of occurrence, preparation and general characters of the olefines. Distinction between saturated and unsaturated hydrocarbons.

(3.) Acetylene or Ethine Series $C_n H_{2n-2}$.

Preparation and distinctive characters of acetylene.

Derivatives of the Hydrocarbons.

(1.) *Paraffins.—Haloid derivatives;* methyl chloride, methene chloride, chloroform, carbon tetrachloride, iodoform, ethyl chloride, bromide and iodide, ethene dichloride and dibromide.

Alcohols.—Methyl, ethyl, propyl, butyl, and amyl alcohols; primary, secondary and tertiary alcohols.

Methyl alcohol.—Destructive distillation of wood. Purification and properties of methyl alcohol.

Ethyl alcohol.—Modes of occurrence. Industrial preparation of spirituous liquids. Rectified, proof, and methylated spirits. Alcoholometry.

Preparation of pure alcohol, compounds and chief reactions of alcohol, constitution of alcohol. Fusel oils. Properties of propyl, butyl, and amyl alcohols.

Ethereal Salts.—Ethyl acetate, acid sulphate and sulphide, and mercaptan.

Ethers.—Manufacture of ethyl oxide.

Aldehyds.—General methods of preparation. Properties of formaldehyde, acetaldehyde.

Acids.—Series of fatty acids. General methods of preparation. Formic acid, occurrence, preparation, and properties. Acetic acid, manufacture. Vinegar, chief acetates.

Discussion of the constitutions of acetic acid, propionic acid, normal and isobutyric acids, palmitic and stearic acids. Nature of common fats, process of saponification. Hard and soft soaps.

Acetic anhydride and acetyl chloride, and their use as reagents for the recognition of hydroxyl.

Ketones.—Preparation and properties of acetone.

Compounds of alcohol radicles, with nitrogen, phosphorus, arsenic, silicon, and the metals, especially zinc and mercury. Cacodyl and its chief derivatives. Preparation and properties of zinc ethyl.

Amines.—Preparation and properties of primary, secondary, and tertiary ethyl monamines. Preparation and properties of phosphonium iodide.

Amides.—Distinguished from amines. Preparation and properties of acetamide.

Amido Acids.—Glycine (glycocoll).

(2.) *Olefines.*—Haloid compounds and derivatives of olefines, especially ethylene dichloride, and dibromide.

Alcohols.—Preparation and properties of glycol, acids from glycol, glycolic and oxalic acids, succinic, malic and tartaric acids and citric acid. Their modes of occurrence, preparation and properties.

Synthesis of succinic, malic, and tartaric acids.

Lactic Acids.

Allyl alcohol.—Acrolein, acrylic acid. Oils of mustard and garlic. Preparation and characteristic reactions of allyl alcohol.

Glycerin, and its chlorhydrins and nitrate (nitro-glycerin).

Mannitol and the *Carbohydrates*.—Cane sugar, dextrose (glucose) and levulose (fructose), maltose, milk sugar. Their occurrence in nature, manufacture, properties and distinctive tests.

Starch and the dextrins. Cellulose and gun-cotton.

Cyanogen Compounds.—Synthetical formation of cyanides.

Manufacture and properties of potassium ferrocyanide and ferricyanide, Prussian blue.

Manufacture of hydrocyanic acid, the cyanides of potassium silver and mercury.

Preparation and properties of cyanogen.

Cyanic and cyanuric acids. Urea.

Constitution of urea. Source and characters of uric acid.

Second Stage.

Division of the carbon compounds into—

(1.) The *Fatty Division*.
(2.) The *Aromatic Division*.

Constitutional differences between the two classes of compounds.

Examples of the production of closed chain compounds from compounds of the fatty division

Benzene.—Sources, preparation and properties. Constitution of benzene. Preparation and properties of its more important homologues, especially toluene, the three xylenes, and cymene.

Mono-derivatives of benzene, viz. :—chloro-, bromo-, and nitro- benzene and benzene-sulphonic acid, also dinitrobenzene. Preparation and chief properties. Isomeric monochlorotoluenes.

Phenol.—Sources, manufacture and properties; nitro-phenols including picric acid.

Aniline.—Sources, manufacture and properties. Preparation of amine sulphate, and hydrochloride. Action of nitrous acid upon aniline in aqueous and in alcoholic solutions. Constitution of diazo-compounds.

Nitranilines.—Preparation and characters.

Toluidine, source, manufacture and chief properties. Preparation of magenta dye. Constitution of rosaniline and its methyl and phenyl derivatives.

Phenyl hydrazine.—Preparation, properties, and uses as a reagent.

Quinone.—Preparation and properties.

Hydroquinone (Quinol).—Preparation and properties.

Benzyl alcohol.—Production from toluene.

Benzaldehyd.—Production from bitter almonds.

Amygdaline, an example of a glucoside.

Manufacture of benzaldehyde from toluene.

Benzoic acid.—Sources, manufacture, and properties.

Hydroxybenzoic acids, especially salicylic acid.—Sources, manufacture, properties, and uses of salicylic acid.

Toluic and *Phthalic acids*.—Sources and relations of.

Naphthalene.—Sources, purification, and properties, and derivatives of naphthalene.

Preparation and properties of the monochloro-naphthalenes, naphthalene-sulphonic acids, and naphthols, naphthol yellow. Constitution of naphthalene.

Anthracene.—Sources, purification and properties. Anthraquinone, preparation and methods for its conversion into hydroxyanthraquinones.

Alizarine, natural source and artificial production.

Constitution of Anthracene.

Pyridine.—Sources, purification, and properties. Constitution of pyridine.

Quinolines.—Source and properties of the quinolines (quinoline and leukoline).

Alkaloids.—Their general characters. Sources, preparation, and properties of morphine, strychnine, quinine, cinchonine, coniine, piperine, and piperidine.

Uric Acid Group.—Theobromine and caffeine.

Methods of distinguishing primary, secondary and tertiary bases.

Stereo-isomerism.

Van t'Hoff's hypothesis and its application to a few prominent cases, *e.g.*, the lactic and tartaric acids, amyl alcohols, valeric acids, glucoses.

Honours.

For honours, candidates will be required to show a thorough knowledge of the sources, preparation, and properties, and chemical relations of all the more important carbon compounds, including recent discoveries.

Special attention should be paid to methods of organic analysis and methods for the determination of molecular weight, the action of the more important reagents and the precise methods of using them in the investigation of the constitution of carbon compounds; modern views of constitution, including the hypotheses of geometrical isomerism; orientation in the aromatic series and methods of determining the constitution of derivatives of benzene, naphthalene, &c. Synthetical formation of closed chain compounds. Physical properties of carbon compounds, and the relation of physical properties to constitution.

Note.—No candidate, who does not pass the practical as well as the theoretical examination can obtain a medal or certificate in honours. *See* Science Sec. 46 & 48, p. 40.

SUBJECT XI. *p.*—ORGANIC CHEMISTRY, PRACTICAL.

First Stage.

In the first course the practical knowledge of the candidate will be tested both by a written and practical examination:—

I.—In the written examination the candidate will be expected to be practically acquainted with, and will be questioned upon the preparation of compounds enumerated in the First Stage of Subject XI., and the methods of experimentally demonstrating their properties. These questions will, as much as possible, be so framed as to prevent answers being given by students who have obtained their information merely from books and oral instruction. Any student on whom it is intended to claim payments in this stage may be called on by the Inspector of the Department, when visiting the Laboratory, to repeat some of the experiments which he has had the opportunity of witnessing.

II.—For the practical examination the student will be required to make himself practically acquainted with the re-actions of, and tests for, the following substances, and will be required to recognise in two or more powders soluble in water or dilute acid the following bodies: methyl and ethyl alcohols, glycerin, formic acid, acetic acid, oxalic acid, tartaric acid, citric acid, salicylic acid; not more than two of them being present in any one solution. The results to be carefully written out, and the presence of all bodies to be confirmed by two or more reactions.

No notes, books or analytical tables may be consulted during the examination.

Two and a quarter hours will be allowed for the examination in practical analysis and one hour for the written examination.

Second Stage.

The examination will consist of two parts:—

I.—A short written examination with the object of testing the candidate's knowledge both of the principles of the analytical processes and the methods of preparing and demonstrating the properties of such bodies as are enumerated in Second Stage, Subject XI.

II.—For the practical examination, the student will be required to make himself practically acquainted with the methods of detecting carbon, hydrogen, nitrogen, sulphur, chlorine, bromine and iodine in carbon compounds, the determination of melting and boiling points. He will also be required to examine qualitatively two mixtures each containing not more than two organic bodies.

The substances for analysis may contain the following constituents:—Hydrocyanic acid, formic acid, benzoic acid, oxalic acid, acetic acid, tartaric acid, citric acid, salicylic acid, cane sugar, glucose, starch, methyl and ethyl alcohols, glycerin, aniline, phenol, morphine, and urea.

He may also be required to prepare specimens of familiar compounds from materials supplied.

No notes, books or analytical tables may be consulted during the examination.

The remarks with respect to inspection made in the elementary stage apply also to this grade.

Three and a quarter hours will be allowed for the examination in practical analysis and one hour for the written examination.

Honours.

The examination will consist of two parts:—

I.—An examination in qualitative analysis as in the second stage (practical).

IIA.—The quantitative determination in one or more specimens (liquid or solid) given for analysis of the per-centage of carbon and hydrogen, or of one of the following: nitrogen, chlorine, bromine, sulphur; or determination of the molecular weight of an organic compound.

IIB.—Preparation of specimens; separation of organic compounds by distillation; fractional solution or crystallization: isolation of products of decomposition.

See notes at the end of the syllabus for Honours in Subject XI., and Subject X.

Laboratory for Practical Organic Chemistry.

A Laboratory fitted up and equipped in accordance with the conditions specified in the case of Practical Inorganic Chemistry (*see* end of syllabus of Xp., page 17) may be also used for instruction in Practical Organic Chemistry provided that in addition to the apparatus and reagents prescribed for that subject the following are kept for general use in the Laboratory, namely, a combustion furnace and combustion tubing, and a supply of the usual glass absorption bulbs, measuring vessels, and other appliances commonly employed in organic analysis and investigation.

SUBJECT XII.—GEOLOGY.*

First Stage or Elementary Course.

The Crust of the Globe. Rocks and their Classification. Crystalline, Vitreous and Clastic rocks. Aqueous, Igneous (Volcanic and Plutonic) and Metamorphic rocks.

General characters and composition of the following groups of Minerals: Quartz, Opal, and Chalcedony; Felspars; Micas; Hornblendes and Augites; Carbonates of Lime and Magnesia; Oxides and Sulphides of Iron.

The general characters of the following types of Rocks:—Granite, Diorite, Gabbro; Rhyolite, Andesite, Basalt; Volcanic glasses, Pumice, Volcanic dust; Conglomerates, Sands and Sandstones; Clays, Shales, and Slates; Limestones and Coals; Rock-salt and Gypsum; Gneiss and Schists.

Forms of stratification. Proofs of the original horizontality of strata. False-bedding. Thinning out and changes in the characters of beds. Ripple-

* *This syllabus has been recast.*

mark and other features produced during deposition. Consolidation of strata: Formation of concretions: Jointing: Cleavage: Metamorphism. Elevation: Proofs of slow and violent movements in the Earth's Crust: Bending, Folding, and Inversion of strata. Outcrop: Dip and Strike. Faults: Hade and Throw. Denudation—Subaërial and Marine. Escarpments, Outliers and Inliers. Unconformity and Overlap. Drawing simple geological sections.

Fossils: their nature and mode of preservation. Pseudo-fossils. Derived fossils. Use of fossils in distinguishing between marine and freshwater strata. The meaning of the terms species, variety, genus, family, order. Extinct forms. Faunas and Floras.

Use of fossils in making a chronological classification of stratified rocks. Strata identified by their organic remains. General characteristics of the forms of life in the Cainozoic, Mesozoic, Newer Palæozoic and Older Palæozoic Eras respectively. The order of succession of the great geological systems and the leading characteristics of their British representatives.

Volcanic rocks. Crystalline and glassy lavas. Scoriæ, lapilli, tuffs, &c. Different types of volcanic outbursts. Explosive and effusive action. Volcanic cones and their varieties. Volcanic dykes. Parasitical cones and Composite volcanic mountains. Volcanic craters. Consolidation and alteration of volcanic materials. Volcanic rocks associated with strata of different geological periods.

Plutonic Rocks. Granitic masses and their mode of occurrence: Porphyritic, pegmatitic, and drusy varieties. Veins: Dykes: Sheets (sills). Included fragments and segregations. Relations of plutonic masses to the rocks into which they are intruded. Contact metamorphism around plutonic rocks. Evidences of differences of geological age in plutonic rocks.

Metamorphic rocks. Degrees of metamorphic action. Nature of minerals formed by metamorphic action. Distinctive characters of gneisses, granulites, and schists. Foliation. Mineral veins and other ore-deposits. Chief minerals occurring as ores and veinstones. Arrangement of minerals in veins. Relation of mineral veins to rocks which they traverse.

Second Stage or Advanced Course.

Distribution of temperature in the Earth's crust and the observations by which it is determined. Isogeotherms. Comparison of the density of Earth with that of its Crust. Chemical composition of the Earth's crust and of Meteorites.

The common rock-forming minerals. Their forms of crystallization, physical peculiarities, chemical composition; and the characters by which they can be distinguished in thin sections under the microscope.

The macroscopic and microscopic characters of the common types of rocks. Their chemical composition, mineralogical constitution, and distinctive structures. The changes which rocks undergo as the result of surface and deep-seated action and the secondary minerals formed in them.

Distinction between False-bedding and Unconformity. Conditions of deposition as indicated by characters of strata. Origin of oolitic and other structures in aqueous rocks. Origin of flint and chert. Formation of various nodular structures. Septaria, cone-in-cone, &c. Varieties of jointing. Origin of joints. Cleavage, its nature and origin. Folds, Faults, Thrusts, and their varieties. Fault rock, slickensides, mylonites, &c. Contact and Regional Metamorphism. Nature of Earthquakes and their connexion with movements in the Earth's crust. Calculation of true dip from apparent dip. The methods employed in constructing geological sections and maps.

The nature of the processes to which fossils owe their preservation. Fossilization by different mineral substances. Portions of organisms that undergo fossilization. Casts, tracks, burrows, &c. The chief living and extinct groups of the Animal and Vegetable kingdoms. Range in space and time. Persistent types. Synthetic types.

Subdivision of the systems of strata into stages and zones, characterised by their faunas and floras. Limitations of the palæontological method. Homotaxy. Leading features and characteristic fossils of the series of British formations. Variations in character and thickness of the British formations, and their general correlation with strata in Europe, North America, and other parts of the world.

Volcanic rocks of different composition and structure. Formation of peculiar types of Volcanic products. Banded, spherulitic, perlitic, and pumiceous structures. Volcanic bombs and pseudo-bombs. Pélé's Hair. Ejected blocks. Chemical and physical changes which lavas undergo. Comparison of ancient and modern lavas; and explanation of the formation of secondary minerals and structures.

The chief types of Plutonic rocks. Light thrown on their mode of origin by the microscopic study of their structures and of the minerals of which they are composed. Varieties of dykes, sheets, and veins. Distinction between interbedded and intrusive igneous masses. Nature and origin of minerals produced by contact-metamorphism. Tests of age in Plutonic rocks. Veins and included fragments.

Theories of Metamorphism. Thermo-metamorphism and Dynamo-metamorphism. Varieties of foliated structure. The structure of great mountain chains and the succession of operations by which they have been produced. The origin of mineral veins and other ore-deposits. Geological age of different ore-deposits.

Honours.

Candidates for honours in Geology will be expected to show a knowledge of the great features of the ocean and the atmosphere, of the distribution of temperature and pressure in both, and of the movements which take place in the fluid envelopes, together with the results of the action of air and water upon the Earth's solid crust. They will also be required to answer questions on the nature of the deposits now being accumulated upon the ocean-floors. Exact information must also be possessed on such subjects as Coral-reefs, Glaciers, Volcanoes, and Earthquakes.

They will also be expected to show a considerably wider acquaintance with the subjects of Petrology, Palæontology, Stratigraphical Geology and Geological Surveying than in the advanced stage.

Honours Candidates must know something of the instruments and methods employed in geological research; and those who qualify in the written examination may be required to attend a Practical Examination at South Kensington at a subsequent date.

SUBJECT XIII.—MINERALOGY.

Practical Work.

Each candidate for examination in Mineralogy must be provided with a set of the following reagents and apparatus. This set should be of a portable character so as to be available for use in any examination room.

Gas, Oil, or Candle flame.
Mouth Blowpipe.
Platinum Wire.
„ Foil.
Charcoal.
Open and closed Glass Tubes.
Silver Foil or old Silver Coin.
Magnet.
Knife.
Lens.
Tinfoil.
Cobalt Glass.
Copper Wire.
Borax.
Carbonate of Soda.
Nitre.
Bisulphate of Potash.
Microcosmic Salt.
Nitrate of Cobalt.
Hydrochloric Acid.
Litmus Paper, red and blue.

Specimens of minerals will be sent for an examination in which the blowpipe and dry reagents will be used. The specimens sent to be examined will be in the state of coarse powder, and are to be tested as to their physical and chemical properties in accordance with the syllabus so far as the use of the above-mentioned apparatus and reagents will permit.

In the Elementary Stage *two* substances will be sent for each student to examine; in the Advanced Stage, three substances, and in Honours the

number of substances given will depend upon the number of the elements which each specimen may contain. In the Elementary Stage the candidate will be required to detect the presence of not more than two elements (Hydrogen and Oxygen excepted) in any one specimen. In the Advanced Stage, three or four elements may be present, and should be identified, in each specimen, in addition to Hydrogen and Oxygen. The comparative fusibility, the effect of heating in closed and open tubes, the colour given to the flame the incrustation on charcoal, the effects of fusing metallic oxides with borax, and, for the Advanced Stage, with microsmic salt, should be clearly stated. Candidates in Honours will be required to make a full and complete examination of the specimens sent for their use.

First Stage or Elementary Course.

A. Instruction in this subject should commence with a distinct understanding of the characters and circumstances by which minerals, properly so called, are to be distinguished from other inorganic substances, and of the position of this science in relation to the collateral sciences of physics, chemistry, and geology. Definitions of a mineral and of a crystal. The conditions crystalline and amorphous. Occurrence of other more or less regular forms. Distinction of compound masses or mixtures of minerals.

B. Crystallography, as the essential means of appreciating the forms naturally assumed, under favourable conditions, by almost all inorganic bodies of definite composition, must commence with the needful definitions; faces, edges, and solid angles; plane figures of three, four, five, six, and eight sides; the names and chief features of the more important geometrical solid figures which occur among crystals; the object of referring the faces to systems of axes, and the various directions in which these may be placed; symmetry of crystals; planes and axes of symmetry; the symmetry of the six crystallographic systems.

Method of drawing crystals isometrically.

Relation of the hemihedral to holohedral forms.

The grounds for grouping the various crystal forms into six systems.

Laws by which the derivation of one form from another within the limits of the same system is determined.

Complex or modified crystals may be regarded as combinations of the faces of two or more simple forms.

The leading figures of the six systems to be studied, with frequent practice in drawing, plane projection being recommended first.

Parallel grouping of crystals.

Twin crystals and hemitropes; the relative position of the axes of their several portions. Definition of the terms twinning-plane, twin axis, and plane of composition. A plane of symmetry is never a twinning-plane.

Irregularities to which the surfaces of crystal faces are subject, certain angular elements remaining constant; measurement of these latter by instruments. Principles of the contact, and of the reflecting goniometer. Construction of Miller's simple reflecting goniometer.

C. Aggregation, or natural grouping of crystals, especially with reference to structure and general form of masses of the useful minerals and of crystalline rocks.

D. Other physical properties.—The cleavage of crystallised substances, and its relation to crystalline form. Fracture, its various characters. Comparative hardness, how best determined. Different qualities of tenacity. Specific gravity of solids, how determined; the ordinary balance, the specific gravity bottle, Jolly's spring balance, Walker's balance.

Property of magnetism; what substances are capable of being attracted by a magnet, and what is the comparative intensity of the effect. Polarity. Influence of certain minerals disseminated in rocks on the correctness of surveys. Electrical properties of minerals.

Peculiarities of smell, taste, and feeling which distinguish a limited number of minerals.

E. Optical characters.—Single and double refraction, and their relation to certain crystallographical systems.

Different degrees of lustre and transparency.

Colour essential in some species, not so in others; varieties of colour, how far they are capable of definition.

Phosphorescence as produced by different methods and exhibited by certain minerals.

F. Chemical characters.—Simple or elementary substances; some of them occur as minerals; their symbols and the derivation of the same. Equivalents; chemical combinations; principal groups of these occurring in the mineral kingdom.

Dimorphism of particular substances, accompanied by a difference in other physical characters besides form.

The employment of acids in the discrimination of minerals.

The blowpipe, its form and uses; the reducing and the oxidizing flames. Trial of comparative fusibility, effects of heating in open and closed tubes, of the colour given to the flame, the incrustation on charcoal; the effects of fusing various metallic oxides with beads of borax glass.

Specimens will be sent for an examination in which the blowpipe and dry reagents will be used.

Pseudomorphism.—The phenomena presented by minerals which have the composition of one mineral coupled with the form of another Fossilization or petrifaction.

G. General requirements of a system of classification of minerals.

H. The physiography or systematic description of minerals. This last division should include all the more remarkable varieties as well as species, and should take especial note of the modes of occurrence as well as of the association of particular groups of minerals in certain veins or formations.

It would not be expected that the elementary course should include the description of the rarer substances, or of those species whose characters are not yet well ascertained. Attention should be restricted to the principal species which form the constituents of rocks and those which as ores supply the materials for the production of the useful metals.

Second Stage or Advanced Course.

A. Discussion of the relation of true minerals to other inorganic substances, and how far bodies of organic origin may be classed among minerals.

B. The dependence of the axial system in crystal forms on symmetry. The crystallographical value of a face is the same as that of any plane parallel to it, on the same side of the centre of the crystal. Position of the normals to a face. The methods of indicating the faces, and thence the entire forms of crystals by symbols. Drawing of a sphere of projection in which the poles of the crystal faces may be shown. Convenience of representing in a great circle the poles of a zone of faces. The magnitude of the angle between the normals being the supplement of the mutual inclination of the planes, the first kind of measurement (i.e., between the normals) is adopted by certain authors, and is easily reducible into the other kind. Statement of the angular and linear dimensions requiring to be determined for the description of the simple forms of all the systems after the cubical.

Twin crystals, planes of composition, twin planes, and twin axes; examples of their position in important minerals of the several systems.

C. Reticulated, wiry, and capillary forms, explanations suggested as to their formation. Other peculiarities in grouping.

D. The prevailing directions of cleavage in the several crystallographical systems.

Determination of the specific gravity of a substance contained in a mechanical mixture. Sonstedt's solution; Klein's solution; Mohr's method of taking specific gravities.

Electricity; by what means this property is exhibited in different minerals. Pyroelectricity. Nature of analogous and antilogous poles. Frequent association of pyroelectricity with hemimorphism.

E. Propagation of light; wave lengths; amptitude of vibration; interference, &c. &c. Refraction of light; different positions of the ordinary and extraordinary ray in doubly-refracting bodies. Optic axes, uniaxial, and biaxial crystals. Bisectrices and optic-normal.

Polarized light, its connexion with double refraction. Construction and use of the polariscope.

Polarisation with parallel and with convergent light; axes of optical elasticity. Interference figures of uniaxial and biaxial crystals. Determination of optical sign by means of quarter-undulation-plate and quartz-wedge. Circular polarisation. Pleochroism, and the means of determining the existence of this property in a mineral. Face-colours an axis-colours.

F. Character of the chemical composition of the more complex minerals.

The electro-negative element in chemical combinations has the preponderating effect in influencing the external character.

Isomorphism, illustrated by the principal isomorphous groups of minerals.

Testing of minerals in the moist way simply practicable for qualitative purposes, except in the laboratory.

Treatment of various metallic ores before the blow-pipe.

Pseudomorphous substances as arranged in groups according to the nature and degree of change they have undergone. Change of volume sometimes induced by pseudomorphism.

Discussion of the conditions under which pseudomorphs have been produced.

G. Methods of classification as proposed by the leading authors in mineralogy.

Discussion of the means of defining a species among minerals.

H. Species and varieties of minerals as described in the best manuals. Their occurrence under various circumstances to be particularly studied. The changes in composition wrought by nature (pseudomorphous action), by which one species is converted into another, and the essential points of difference between species much alike in certain characters, will be held of much importance in dealing with the minerals of special value or interest. It is not expected that the memory should be charged with the details of substances of very rare occurrence, or of doubtful independence as species.

Examination for Honours.

The questions will as a general rule be such as are embraced in the above syllabus, but candidates will be required to prove a practical acquaintance with minerals and with crystal forms, and will need to have studied the more advanced works. A knowledge of the microscopic characters of the chief rock-forming minerals should be acquired, and of the newer methods of investigating the physical and chemical nature of minerals.

List of some of the principal Minerals recommended for Study in the Elementary Stage.

Diamond, graphite, anthracite, coal, lignite, amber, borax, sulphur, calcite, aragonite, dolomite, gypsum, anhydrite, apatite, fluorspar, nitre, rock-salt, magnesite, barytes, witherite, celestine, strontianite, corundum and its varieties, spinel, alumstone, cryolite, turquois, quartz and its varieties, chalcedony and its varieties, opal and its varieties, the garnet group, sodalite, leucite, idocrase, zircon, apophyllite, nepheline, tourmaline, beryl and its varieties, the mica group, some of the most common zeolites olivine, andalusite, staurolite, topaz, the pyroxene group, the amphibole group, talc, chlorite, epidote, the felspar group, serpentine, meerschaum, kaolin. A few of the commoner clays. The

chief ores of manganese, arsenic, antimony, bismuth, zinc, tin, lead, iron, copper, mercury, and silver.

The above is only an imperfect list, and it is quite possible that occasionally questions may be set or specimens given for determination in the examination of candidates in the elementary stage which involve some acquaintance with minerals not included in this list, although in such cases they would also relate to well-known minerals, descriptions of which would be found in any elementary text book.

The teacher is recommended to treat the descriptive part of his subject in such a manner that certain important groups of minerals, underlined in the list, may be dealt with in separate lessons, while, as regards the other minerals enumerated, he will find it advantageous to arrange them, where practicable, in isomorphous groups.

A similar method of teaching is also to be recommended for the Advanced stage, but the candidate will in this examination be expected to have a more extended knowledge, not merely of descriptive Mineralogy, but also of the general principles of the science.

SUBJECT XIV.—HUMAN PHYSIOLOGY.

Syllabus.

First Stage or Elementary Course.

Questions will be confined to the under-mentioned points in the elements of Anatomy and Physiology.

Candidates are expected to have seen the corpuscles of the blood under a microscope, magnifying about three or four hundred diameters. It is also desirable that they should have made themselves acquainted in like manner with the general microscopic characters of the cells constituting epithelium. Other details of structure needing the use of a microscope will not be asked for.

The information demanded under "Chemical Preliminaries" is limited on the one hand to elementary and fundamental chemical principles, as applied to the animal body, and on the other to the important properties of the chief chemical substances composing the body and food; in respect to these points the answers must be precise, but no further chemical knowledge will be required.

No candidate will be allowed to pass who in the answers makes gross errors concerning the general build of the body and the relations of its several parts, the structure and working of the heart and the main facts of the circulation, the mechanical and chemical changes of respiration, the chemical nature of food, its changes in the alimentary canal, and its use in the body.

A. Anatomical Preliminaries.

The general build of the body.

The form, the position, and the uses of the following parts of the skeleton:—skull, vertebræ, ribs, sternum; scapula, clavicle, humerus, radius, ulna, carpus, metacarpus, phalanges (of the hand); pelvis, femur, tibia, fibula, tarsus, metatarsus, phalanges (of the foot).

The more obvious distinctive characters of skin, mucous membrane, glands, connective tissue, tendon, ligament, cartilage, bone, muscle, and nerve.

The position in the body, and the general form and size, of the following internal organs:—The brain and spinal cord; the pharynx, gullet, stomach, and intestines; the salivary glands, the liver, and the pancreas; the posterior nares, the larynx, trachea, and lungs; the diaphragm; the kidneys and the bladder; the heart and the great vessels; the spleen.

B. Chemical Preliminaries.

The simpler chemical properties of carbon, oxygen, hydrogen, and nitrogen; the meaning of the terms "element," "compound," "decomposition," "oxidation," as illustrating elementary chemical principles.

The composition, nature, and properties of air, water, carbon dioxide (carbonic acid), and ammonia.

The chemical elements of which proteids, fats, and carbohydrates are composed; the general chemical properties of these substances, and the relative proportions in which the several elements are present in each of them.

The composition and general nature of urea.

C. General View of the Animal Body in Action.

The movements of the body as the result of muscular action.

Muscular action viewed as chemical change (oxidation) of the muscle, whereby energy is set free, and waste of substance caused.

The blood as the agent which (*a*) removes the waste, and (*b*) supplies fresh nutritive material to make good the waste.

The waste matter in the blood got rid of by the excretory organs. The fresh nutritive material in the blood supplied to it from food by means of the digestive organs.

The control of the muscles by the nervous system, consisting of (*a*) sensory or afferent nerves, (*b*) the brain and spinal cord, (*c*) motor or efferent nerves.

The general functions of the brain and spinal cord.

The maintenance of the erect posture.

Local and general death.

D. Special Physiology.

a. The Blood.

The form, size, and structure of the corpuscles of the blood.

The general composition of the blood.

The phenomena presented by blood drawn from the body; clotting of blood.

b. The Circulatory System.

The general structure of the heart; the form and arrangement of its chambers; the nature of its walls; the form and position of its valves. The differences between the right and left side of the heart.

The action of the heart as a force-pump.

The mode and action of the valves during the heart-beat.

The general differences between arteries, capillaries, and veins.

The course of the circulation and the reason why the blood moves in only one direction.

The characters of and differences in the blood-flow in arteries, capillaries, and veins.

The meaning of the "pulse."

The evidence of the circulation obtainable in the living body.

c. The Alimentary System.

The general form and arrangement of the alimentary canal in its several parts.

The more obvious characters of the mucous coat, and the differences in respect to it between the stomach and the small and large intestine.

The relationship of the salivary and gastric glands, and of the pancreas and liver, to the alimentary canal. The character and uses of their secretions.

The general nature of food. The classification of food stuffs. The changes the several food stuffs respectively undergo in the alimentary canal, and how these are brought about.

The manner in which nutritive matters are absorbed and innutritious matters got rid of from the alimentary canal.

The economy of a mixed diet.

d. The Liver.

Position and general structure of the liver. The blood supply to the liver.

The obvious characters and properties of bile.

e. The Respiratory System.

The arrangement of the ribs, sternum, intercostal muscles, and diaphragm. The manner in which the walls and floor of the chest change their position during the respiratory movements.

Why air enters and leaves the chest during inspiration and expiration respectively.

The course taken by the air when breathing through the nose.

In what respects the air which leaves the lungs differs from that which enters them.

The obvious differences between venous and arterial blood. Where and how venous blood is converted into arterial, and arterial into venous blood in the body. How venous blood can be converted into arterial blood out of the body.

The conditions which give rise to asphyxia.

f. The Urinary System.

The structure of the kidney so far as it is visible to the naked eye.

The composition of urine as far as its chief constituents are concerned; the significance of these as waste products.

g. The Skin.

The obvious differences between the dermis and epidermis.

The general composition of sweat.

The more obvious functions of the skin.

h. Animal Heat.

The sources of the heat of the body. The manner in which heat is distributed through the body, and in which the temperature of the body is regulated.

i. The Muscular System and Animal Mechanics.

The structure of muscle, of tendon, and of bone, so far as it can be made out by the naked eye or a simple lens. The mode of attachment of muscles to bones.

The nature of joints, with examples of ball-and-socket, hinge, and pivot joints.

The different kinds of levers, with examples of them in the body.

The way in which muscles lead to the movements of the body.

k. The Senses.

The different kinds of sensations.

The means of measuring the acuteness of the sense of touch in various parts of the body.

The general structure of the organs of smell and taste, and the manner in which their functions are performed.

The general structural arrangements of the eye-ball. Such characters of the cornea, sclerotic, choroid, iris, aqueous and vitreous humours, crystalline lens and retina as can be observed by ordinary dissection. The uses of the cornea, iris, and crystalline lens.

How the pupil is enlarged and made narrower, and for what purposes.

The change undergone by the lens when looking from a distant to a near object; the object of this change.

The blind spot, and what it teaches.

The essential facts as to the structural arrangements of the ear so far as they are required to explain how sound-waves are conveyed to the nerves of hearing.

l. The Nervous System.

The chief parts into which the brain may be divided.

The structure of the spinal cord so far as it is visible to the naked eye. The arrangement and the functions of the roots of the spinal nerves.

The general way in which the spinal cord is connected to the brain by means of the spinal bulb or medulla oblongata.

The evidence that the spinal cord is capable of effecting reflex action.

The general phenomena presented by an animal deprived of its brain, as illustrating some of the more important functions of the brain.

Second Stage or Advanced Course.

In addition to the preceding, a knowledge of the following subjects, as defined below, will be required.

In this stage, in contrast to the Elementary Stage, a practical acquaintance, by the use of a microscope, with the minute structure of the several tissues and organs is essential; but a knowledge of well-established features only will be required, to the exclusion of all doubtful and controverted details.

a. The Blood and Lymph.

The size and structure of the corpuscles of these fluids. The phenomena which they exhibit. Their probable origin, functions, and fate.

The composition of the blood in detail. The nature of the process of blood-clotting.

The quantity of blood in the body, and its distribution.

The microscopic characters and chemical composition of lymph.

b. The Circulatory System.

The structure of the heart. The general distribution and arrangement of the principal arterial and venous trunks. The minute structure of the heart, arteries, veins, and capillaries. The disposition of the capillaries in the various tissues.

The detailed analysis of the movements constituting a 'beat' of the heart; the changes of form undergone by the several parts of the heart during a cardiac systole, their nature and effects in propelling the contents of the several cavities, and their time relations. The details of the action of the valves of the heart. The sounds of the heart.

The physical properties of the blood vessels. The mechanics of the circulation. Blood-pressure. The circumstances determining the rate of flow. The phenomena of the pulse.

The nervous arrangements of the heart. The nature of the rhythmic movements of the heart; how these are maintained, and how they are modified according to circumstances; the influence of the pneumogastric and of other nerves on the heart.

The vital properties of the blood vessels. The influence of the nervous system on the blood vessels; vaso-motor nerves. The regulation of the blood supply by means of the nervous system. The influences exerted by the walls of the blood vessels on the flow of blood as seen in inflammation.

The structure of the lymphatic vessels and glands, and the connexion of the lymphatic with the blood vascular system. The origin of the lymphatics. The causes which determine the amount of lymph present in the lymphatic spaces, and those which determine the flow of lymph along the lymphatic channels.

c. The Alimentary System.

The structure and functions of the salivary glands. The structure and functions of the tongue, the soft palate, uvula and tonsils. The pharynx and the œsophagus, and the structure of their walls. The stomach, its form; the structure of its walls; its glands and their functions. The divisions of the intestine. The structure of its walls. Villi. Glands. Peyer's patches. The structure and functions of the pancreas. The peritoneum and the nature of the mesentery.

The phenomena of secretion as observed in the salivary glands, pancreas, and other secreting organs, and the manner in which it is governed by the nervous system. The action of the chorda tympani.

The details of the digestive and absorptive processes.

The structure of the liver, and the course of the blood through it. The arrangements of the ducts of the liver. The composition and functions of the bile. The nature, uses, and fate of glycogen.

The structure of the spleen and of the suprarenal, thymus, and thyroid bodies; and the probable uses of these organs.

d. The Respiratory System.

The structure of the thorax. The pleuræ. The structure of the respiratory organs, and the distribution of the blood through them. The analysis of the respiratory movements in detail. The mechanism by which coughing, sneezing, sighing, and hiccoughing are effected. The gases of venous and arterial blood. The physical and chemical processes involved in the conversion of inspired into expired air, and of venous into arterial blood. The respiratory activity of the tissues and the conversion of arterial into venous blood. The quantity of waste products excreted and of oxygen taken in by the lungs in twenty-four hours. The importance of ventilation.

The manner in which the nervous system maintains and regulates the respiratory movements; the respiratory centre. How the nervous mechanism of respiration is affected (1) by nervous influences, (2) by chemical changes in the blood. The phenomena of dyspnœa and asphyxia, how they are brought about.

The influence of the respiratory movements on the circulation.

e. The Urinary System.

The minute structure of the kidney, ureter, and bladder.

The circulation in the kidney, and the changes which the blood undergoes in passing through it.

The nature of the secretory activity of the kidneys in relationship to the glomeruli and tubules, and the circumstances which affect it. The history of urea.

The quantity and nature of the waste products of all kinds excreted by the kidneys in 24 hours.

f. The Skin.

The minute structure of the skin, and of the hairs, nails, and glands connected with it.

The quantity and nature of the waste products excreted by the skin in 24 hours.

The regulation of sweating by the direct action of the nervous system.

g. Nutrition.

The statistics of nutrition; the income and output of the body, how they are balanced.

The special effects and uses of proteid, gelatinous, fatty, and carbohydrate food stuffs. The changes in the chemical composition of the body resulting from

an excess or deficiency (1) of proteid, (2) of non-nitrogenous food; the effects of starvation. Urea as a measure of the nitrogenous changes of the body. The effects of exercise on the chemical changes and composition of the body. The part played in nutrition by saline bodies.

The energy of the body, its source and expenditure; the amount and character of the daily expenditure.

The production in and the loss of heat from the body; their balance during health, how maintained and regulated by changes (1) in the amount of loss, (2) in the amount of production. The part in this regulation played by the nervous system. The failure of this regulation of heat; the temperature of fever.

h. The Muscular System and Animal Mechanics.

The minute structure of cartilage, bone, connective tissue, and muscle. Cilia and ciliary action.

The changes, physical, chemical, and structural, which take place in a muscle during contraction. The characters of a simple and of a tetanic contraction. Rigor mortis.

The mechanism of standing, walking, running, and jumping.

The structure and working of the larynx.

The mode in which vowel and consonantal sounds and articulate speech are produced.

i. The Senses.

The structure of the papillæ of the skin and of tactile-corpuscles, end-bulbs, and other nerve endings in the skin. Pacinian corpuscles.

The localisation of touch. The sense of pressure, pain, and temperature. The muscular sense.

The minute structure and nervous supply of the tongue as an organ of taste. The structure of taste bulbs. Sensations of taste.

The structure of the olfactory organ. The nature and extent of the air-chambers connected with it. The minute structure of the olfactory (Schneiderian) mucous-membrane and of the olfactory nerve-fibres. Sensations of smell.

The minute structure of the various parts of the eye-ball.

The formation of the image on the retina.

The conditions of distinct vision. Accommodation.

Movements of the pupil. Movements of the eye-ball. Binocular vision. Judgments of distance, form, and solidity.

Evidence that visual impressions begin in the rods and cones.

Colour-vision and colour-blindness.

The structural arrangements of the organ of hearing. The outer-ear. The structure and functions of the middle-ear. The minute structure of the inner-ear.

Auditory sensations. Use of two ears.

k. The Nervous System.

The minute structure of nerves; medullated and non-medullated nerve-fibres. The minute structure of ganglia.

The sympathetic system, its structure and its anatomical and physiological relations to the cerebro-spinal system.

The arrangement and structure of the investments of the brain and spinal cord. The more important structural differences observable in different parts of the spinal cord.

The conduction of motor (volitional) and sensory impulses along the cord.

The general structure of the brain, including the relation and connections of its principal parts, namely, spinal bulb (medulla oblongata), its pyramids, cerebellum, pons varolii, crura cerebri, corpora quadrigemina, optic thalami corpora striata, the fibres of the cerebral hemispheres, and the internal capsule. The relations of the several ventricles. The minute structure of the cerebral cortex.

The relations of the olfactory bulb. The central connections of the optic nerves.

The origins and general functions of the other cranial nerves.

The more important functions of the spinal bulb or medulla oblongata.

The localisation of function in the cerebral cortex.

The maintenance of equilibrium, and its relationship to the semicircular canals.

l. Reproduction.

The mode in which the fœtus is nourished.

The main features of the fœtal circulation; and the changes in the circulation which takes place at birth.

The lacteal glands and lactation.

Examination for Honours.

In this examination, questions will be set at the discretion of the examiner, who will have regard to the state of teaching of physiology in the country, and the means of acquiring information.

The Examination will consist of a preliminary written paper, and those who qualify therein may be required to attend a practical examination at South Kensington at a subsequent date.

It does not seem to be sufficiently understood that the standard of examination for honours is very much higher than that for the second or advanced stage. Candidates attempt the honours paper whose answers show that they are but ill prepared even for the advanced stage. Honours will not be awarded unless a Candidate shows that he has made Physiology the subject of prolonged and careful study.

SUBJECT XV.—GENERAL BIOLOGY.

First Stage or Elementary Course.

For the Elementary Stage a knowledge of the following subjects only will be required, but the candidates will be expected to show a practical acquaintance with them.

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1. The general anatomy of a Frog, as an example of a vertebrate animal. The skeleton of the frog; its component parts, and their uses and relations to other organs. The structure and arrangement of the digestive, circulatory, respiratory, excretory, and nervous systems of the frog, and the uses and modes of action of their several parts.

2. The microscopical characters of the tissues of which the body of a vertebrate consists, and the ultimate formation of all parts of the body from nucleated cells.

The various kinds of epithelial cells; their distribution and uses. Connective tissue; cartilage; bone; nerve cells, and nerve fibres.

The microscopical structure of the kidney and of the spinal cord.

3. The characters of the blood-circulation as seen in the web of a frog's foot. Arteries, veins, capillaries. The blood corpuscles, red and white. The uses of the blood, and the modes and places in which these are effected.

4. Unicellular organisms. The form, size, and structure; the modes of growth and multiplication; and the conditions and results of the living activity of Saccharomyces, Protococcus, Amœba, and Paramecium. The resemblances and differences between these organisms and a white blood corpuscle and an epithelial cell.

5. The structure and mode of growth of Mucor and of Penicillium; the modes and processes of their reproduction; conidia, zygospores, ascospores; the germination of the spores and conidia; the physiology of these moulds, including the conditions and results of their living activity.

6. The structure and life history of a Fern.

(*a.*) *The Sporophyte.* The structure of the root, the stem, and the leaf; and the uses of their component parts. Apical growth of the root and stem; the growing point; the apical cell and the mode of its segmentation; the root cap. The asexual reproductive organs or sporangia; the spores.

(*b.*) *The Gametophyte.* The structure and development of the prothallium; the position and structure of the sexual organs, archegonium and antheridium; the sexual cells; ovum (oosphere); spermatozoid (antherozoid); the process and products of fertilisation; the early stages of development of the embryo sporophyte.

7. The structure and life history of a Bean or other Flowering Plant. The stem, the root, and the foliage leaf; and their principal modifications. The structure of the flower; the calyx, the corolla, the androecium, the gynœcium; the floral leaves, sepals, petals, stamens, and carpels; the symmetry of the flower. The structure of the anther; the pollen sacs and the pollen grains. The structure of the ovary; the ovule, and the embryo sac with its contents. The processes of pollination and fertilisation; the products of fertilisation; the fruit; the seed.

The physiology of the flowering plant. The physiology of nutrition in connexion with the presence of chlorophyll; the absorptive, assimilative, and transpiratory organs; conduction of liquid from the roots to the leaves; transpiration; the distribution of the organic substances formed in the leaves.

The resemblances and differences between Flowering Plants and Ferns.

8. The distinctive characters of animals and of plants, more especially in regard to their modes of nutrition.

Second Stage or Advanced Course.

For the Advanced Stage a knowledge of the following subjects will be required in addition to those included in the syllabus for the Elementary Stage. Candidates will be expected to show a practical acquaintance with the animals and specimens mentioned.

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1. The structure, mode of life and of reproduction of Amœba, Paramecium, and Vorticella. The general characters of Protozoa, and their relations to the higher animals or Metazoa, and to plants. The shell-forming Protozoa, and their influence in the formation of the earth's crust.

2. The Freshwater Polype (Hydra). The general structure and mode of life; the modes of reproduction. Ectoderm, endoderm, and mesoglœa. The microscopical characters of the cells of the ectoderm and endoderm, and their several uses.

3. The Earthworm (Lumbricus). The general structure of the earthworm; the division of the body into segments or somites. The mode of life of the earthworm; the action of earthworms in the formation of vegetable mould. The senses of earthworms.

4. The Freshwater Mussel (Anodonta). The general structure of the mussel, and its mode of life. The shell; its characters; its mode of formation and of growth. The structure, arrangement, and mode of action of the several organs; and especially of the circulatory, respiratory, and excretory systems.

5. The Crayfish (Astacus). The general structure of the crayfish, and its mode of life. The exoskeleton and its several parts; the mode of growth; the appendages. The structure, arrangement, and mode of action of the several organs; and especially the digestive, circulatory, respiratory, and nervous systems. The structure of the eye, and the uses of its several parts.

6. The Cockroach (Periplaneta). The general structure and mode of life of the cockroach. The external characters; the appendages, and especially the mouth parts. The structure, arrangement, and mode of action of the several organs, and especially the digestive, circulatory, and respiratory systems. The chief differences in structure and life history between a cockroach and a butterfly.

7. The Dogfish (Scyllium). The general structure and mode of life of a dog-fish. The external characters, the scales and teeth; the fins. The skeleton of the dog-fish. The structure, arrangement and mode of action of the several organs; and especially the digestive, circulatory, respiratory, excretory and nervous systems. The vertebrate eye and ear; their structure and the uses of their several parts. The main points of resemblance and of difference between a dog-fish and a frog.

8. The outlines of the development of the Frog. The formation of the eggs. Fertilisation and segmentation of the eggs. The development of the tadpole, and especially of the nervous system and alimentary canal. The changes that occur during the metamorphosis of the tadpole into the frog.

SUBJECT XVI.—ZOOLOGY.

First Stage or Elementary Course.

Questions will be confined to the following subjects, with which the candidate will be expected to show a practical acquaintance.

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1. The general characters of the Protozoa. The shells of Foraminifera and of Radiolaria. The structure and life history of the Infusoria.

2. The general characters of the Cœlenterata. The structure and life history of a Hydra, of a Jelly-fish, and of an Anemone.

3. The general characters of the Echinodermata. The structure and life history of a Starfish (Uraster) and of a Sea-Urchin (Echinus).

4. The structure of a Leech (Hirudo).

5. The general characters of the Annelida. The structure and mode of life of an Earthworm (Lumbricus).

6. The general characters of the Arthropoda and of their leading subdivisions. The structure and life history of a Crayfish (Astacus), a Cockroach (Periplaneta,) and a Butterfly.

7. The general characters of the Mollusca and of their leading sub-divisions. The structure and life history of a freshwater mussel (Anodonta), and a snail (Helix).

8. The structure and mode of life of Amphioxus.

9. The structure of a dogfish (Scyllium); more especially the skeleton, and the circulatory, respiratory, and nervous systems.

10. The structure and life history of a frog (Rana).

11. The structure and life history of a fowl or of a pigeon; more especially the skeleton.

12. The general characters of the Mammalia. The structure of a rabbit (Lepus); more especially the skeleton, and the digestive, circulatory, and nervous systems.

Second Stage or Advanced Course.

Questions may be set on the following subjects, in addition to those included in the syllabus for the elementary stage. Candidates will be expected to show a practical acquaintance with the animals and specimens mentioned.

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1. Porifera. The general characters of the group. The structure and life history of a calcareous sponge, and of the freshwater sponge (Spongilla).

2. Cœlenterata. The characters of the leading sub-divisions of the group. The structure and life history of a fixed hydroid polype, as Bougainvillea or Obelia, of a Medusa, and of a Coral. The structure, distribution, and mode of formation of coral reefs.

3. Echinodermata. The characters of the leading sub-divisions of the group. The structure and life history of an Ophiurid, a Holothurian, and a Crinoid (Antedon).

4. Platyelmia. The general characters of the Turbellaria. The structure and life history of a Fluke (Fasciola), and of a Tape-worm (Tænia).

5. Nemertinea. The structure of a Nemertine; and the chief modifications met with in the group.

6. Hirudinea. The structure of a Leech (Hirudo); and the chief modifications met with in the group.

7. Annelida. The characters of the leading sub-divisions of the group.

8. Rotifera. The structure and life history of a Rotifer.

9. Polyzoa. The structure and life history of a fresh-water Polyzoon. The leading modifications met with in the group.

10. Arthropoda. The characters of the leading sub-divisions of the group. The structure and life history of Cyclops, a Crab, a Scorpion, a Centipede, and Peripatus. The chief modifications presented by the eyes, and the excretory organs of Arthropoda.

11. Mollusca. The characters of the leading sub-divisions of the group. The structure and life history of an Oyster, a Limpet, and a Cuttlefish.

12. Pisces. The characters of the leading groups of Fish. The structure of a Cod or other Teleostean fish; more especially the skeleton, and the circulatory, respiratory, excretory and nervous systems.

13. Reptilia. The characters of the leading groups of Reptiles; and especially the skeleton and the circulatory system.

14. Mammalia. The characters of the leading sub-divisions of the group. The essential structure and the principal modifications in the skull and limbs of Mammalia as exemplified by the Dog, Pig, Sheep, Horse, Rabbit, Bat, and Man. The characters, mode of formation, and chief modifications of the teeth of Mammalia, both deciduous and permanent; especially in the types mentioned above.

15. The main facts in the development of Amphioxus, the Frog, the Chick, and the Rabbit; more especially the formation of the germinal layers, the development of the nervous, digestive, and circulatory systems, and the mode in which nutrition and respiration of the embryo is provided for.

16. The leading characters of the marine, freshwater, and terrestrial faunas. The main facts relating to the geographical distribution of vertebrates.

17. The mutual relations of the great groups of animals, both invertebrate and vertebrate; and the evidence on which these are determined.

Honours.

In this examination questions will be set at the discretion of the Examiner, who will have regard to the state of zoological teaching in the country and the means of acquiring information.

The examination will consist of a preliminary written paper, and those who qualify therein may be required to attend a practical examination at South Kensington at a subsequent date.

SUBJECT XVII.—BOTANY.

General Syllabus.

The enumeration of subjects is not intended to do more than guide the teacher. The examination will be especially directed towards ascertaining the amount and character of the practically acquired knowledge possessed by the students. The teaching should always be conducted, as far as possible, with reference to actual illustrative specimens rather than from text book descriptions.

General Morphology, Histology, and Physiology.

I. The differentiation of the plant-body into root, stem, and leaf.

i. The morphology of the root and its modifications; the branching of the root.

ii. The morphology of the stem and its modifications; the modes of branching of the stem; the structure and position of buds; vernation.

iii. The morphology of the leaf; the different kinds of leaves; the branching of the leaf; the different parts of the leaf; *leaf-base*, stipules, petiole, blade; their special modifications; the arrangement of leaves on the stem.

II. The structure of the organs and members, including—

i. The structure of the vegetable cell:

a. The structure and chemical and physical properties of the cell-wall.

b. The structure and chemical and physical properties of the cell-contents, including the protoplasm, nucleus, chlorophyll-corpuscles, cell-sap, starch-grains, raphides, &c.

ii. The distinctive characters and the mode of growth of the tissues.

III. The functions of the various organs; the relation of their structure to their functions.

i. The general processes of nutrition: assimilation; respiration.

ii. The chemical nature (1) of the food materials absorbed from the air and from the soil; (2) of the substances formed within the plant; starch, cellulose, sugars, fats, albuminoids; (3) of the principal ingredients of the ash of plants.

iii. The movements of fluids in the plant; transpiration; root-pressure.

iv. The irritability of plants, as manifested by growing and other motile organs.

v. The influence of light and heat on the various functions of plants.

Special Morphology and Physiology of the Angiospermous Flowering Plant.

The inflorescence and its modes of branching; bracts.

The difference between definite and indefinite inflorescences: the distinctive character of the following kinds; raceme, spike, spadix, corymb, panicle, umbel, head, cyme, glomerule.

The enveloping and essential organs of the flower: æstivation: the symmetry of the flower.

The modifications of the flower due to cohesion, adhesion, suppression, and multiplication of the various parts.

Morphology of the perianth, andrœcium, and gynœceum. The calyx: the sepals; their form, arrangement, and function. The corolla: the petals; their form, arrangement, and function.

The structure and use of the *stamen*; the filament, anther, pollen-sacs, pollen.

The structure of the carpel; the stigma; the style; the ovary; the placenta.

The structure and form of the ovule; the embryo-sac and its contents.

The processes of pollination and fertilisation.

The different forms of fruit: the distinctive characters of the following kinds; achene, nut, drupe, berry, pod, capsule.

The structure of the seed; presence or absence of albumen, structure and position of the embryo, nature of the aril.

The various modes of germination.

The different provisions for the persistence of the individual plant; annuals, biennials, perennials.

The description in technical language of fresh plants, taking the organs in the following order:

Root.	Corolla.
Stem.	Stamens.
Leaves.	Pistil.
Inflorescence.	Ovule.
Bracts.	Fruit.
Flower.	Seed.
Calyx.	Embryo.

The distinctive characters of the classes Dicotyledons and Monocotyledons, and of their principal divisions.

First Stage or Elementary Course.

In this stage strictly elementary questions only will be set on the subjects enumerated above. A knowledge will be required of the characters (including general properties) of the following natural orders, to be recognized upon fresh specimens:

Ranunculaceæ.	Boraginaceæ.
Cruciferæ.	Labiatæ.
Caryophyllaceæ.	Primulaceæ.
Leguminosæ.	Cupuliferæ.
Rosaceæ.	
Umbelliferæ.	Liliaceæ.
Compositæ.	Amaryllidaceæ.
Scrophulariaceæ.	

Second Stage or Advanced Course.

Candidates will be expected, in addition to a fuller knowledge of the foregoing subjects, to exhibit a practical acquaintance with the flora of the British Isles, including the characters of the orders and largest genera, their adaptations for cross-fertilisation, and their general geographical distribution.

They will also be expected to exhibit a practical acquaintance with:—

I. The morphology and physiology of Gymnosperms, as exemplified by Pinus.

II. The morphology and physiology of the Vascular Cryptogams, as exemplified by Selaginella and Aspidium.

III. The morphology and physiology of the Muscineæ, as exemplified by Polytrichum (or Funaria) and Marchantia.

IV. The morphology and physiology of the Algæ, as exemplified by—Fucus, Spirogyra, Protococcus.

V. The morphology and physiology of the Fungi (including *Lichens*) as exemplified by—

Agaricus.	Mucor.
Eurotium.	Saccharomyces.
Parmelia (or Collema).	

Honours.

Candidates will be expected to show a general knowledge, in addition to the foregoing, of the principal exotic orders, with their economic applications and geographical distribution.

They will be also expected to exhibit a general knowledge of the principal forms of the Gymnosperms, Vascular Cryptogams, Muscineæ, Algæ, and Fungi.

The Examination will consist of a preliminary written paper, and those who qualify therein may be required to attend a practical examination at South Kensington at a subsequent date.

SUBJECT XVIII.—PRINCIPLES OF MINING.

This subject is naturally divisible into the two branches of Coal Mining and Metalliferous Mining, and to suit candidates who have studied, or have been practically engaged in either branch, the examination papers will be set in three sections. A. General. B. Coal. C. Metalliferous. A candidate in the Elementary or Advanced Stage is restricted to Sections A. and B. or Sections A. and C.

The questions for examination will cover the matters included in the following list.

First Stage or Elementary Course.

This will treat principally of the simpler operations in actual mining, such as the use of tools (with details of form and dimensions) in driving, sinking, and getting minerals; the cutting and setting of timber; the construction of simple machines; the characters of beds and veins and the composition and characters of the commoner useful minerals. The regulations for ensuring safety in dangerous operations, such as blasting and the removal of minerals and the management of lights in fiery mines, should be familiar to candidates; and they should have some knowledge of the mechanical principles involved in the processes of ventilation, winding, pumping, and the dressing of minerals. Questions may be asked upon the general characters of the larger machines, but without requiring much detailed description.

A.—Coal Mining.

1. Nature and composition of coal and its associated minerals and strata. Faults and other interruptions in coal seams.
2. Search for coal. Surface indications. Methods of boring by hand gear.
3. Breaking ground by manual labour. Picks and other wedging tools Methods of boring by hand and hand-power drilling machines. Gunpowder and high explosives. Safety regulations for shot firing.
4. Sinking. Round and rectangular shafts. Timbering, walling, and tubbing, Sinking through loose ground and quicksands. Rules for ensuring safety in sinking.
5. Forms and dimensions of levels and drifts. Timbering and walling. Use of iron and steel in securing ground.
6. Methods of working. Pillar and stall and long wall working in their different modifications. Square work on thick seams.
7. Underground transport. Manual, horse and machine haulage. Railways in levels and slopes. Forms and dimensions of pit waggons or tubs.
8. Winding. Methods of guiding cages in shafts. Forms and dimensions of cages. Different kinds of drawing ropes and chains. Pit-frames. Windlasses. Horse whims. Steam winding engines.

9. Lighting and ventilation. Composition of air. Gases in mine workings. Circulation of air by furnaces and ventilating machines. Methods of guiding and regulating air currents. Principles of construction and use of safety lamps.
10. Drainage. Methods of raising water by tubs and pumps. Dams in shafts and levels. Regulations for safety in approaching drowned workings.
11. Hand picking and screening coal. Principles involved in coal-washing machinery.

B.—Metalliferous Mining.

1. Composition and character of the commoner metallic minerals and their methods of occurrence. Lodes, beds, and irregular deposits.
2. Search for minerals. Methods of prospecting costeaning and local sinkings
3. Breaking ground by manual labour. Picks and other wedging tools. Methods of boring by hand and hand-power drilling machines. Gunpowder and high explosives. Safety regulations for shot firing.
4. Sinking. Round and rectangular shafts. Timbering, walling, and tubbing. Sinking through loose ground and quicksands. Rules for ensuring safety in sinking.
5. Forms and dimensions of levels and drifts. Timbering and walling. Use of iron and steel in securing ground.
6. Methods of working. Quarry and surface workings. Stoping overhand and underhand on lodes. Fire setting.
7. Underground transport. Manual, horse and machine haulage. Railways in levels and slopes. Forms and dimensions of pit waggons or tubs.
8. Winding. Methods of guiding cages in shafts. Forms and dimensions of cages. Different kinds of drawing ropes and chains. Pit-frames Windlasses, Horse whims. Steam winding engines. Skip roads in shafts of varying inclination.
9. Lighting and Ventilation. Composition of air. Gases in mine workings. Circulation of air by furnaces and ventilating machines. Methods of guiding and regulating air currents. Principles of construction and use of safety lamps.
10. Drainage. Methods of raising water by tubs and pumps. Dams in shafts and levels. Regulations for safety in approaching drowned workings.
11. Principles of dressing minerals in water. Stamps and crushing machines. Coarse and fine sand jigging machines. Buddles and other slime dressing machines.

Second Stage or Advanced Course.

Candidates in this stage should show some knowledge of details in their answers, and should be able to give proper sketches with dimensions when necessary in support of their written descriptions. They should be able to discuss the methods of occurrence and working of minerals in some district (of their own knowledge), and also be generally familiar with those of other districts from study. The constructive details of the machinery and engineering works of mines should also be studied in addition to the general principles. Exactness will be expected in all that relates to numbers, dimensions, and weights, and as neat and accurate drawing as the time will permit.

Where the heading is susceptible of division the part relating to coal mining is given under the sub-head A, and that special to metal mining under B; but where no such distinction is made the matter is to be considered as common to both branches.

1. Mineral Geology and Geography.
   Nature and position of useful minerals in the earth's crust.
   Beds, veins, and irregular deposits.
   Stream works and other alluvial deposits.

A.—Coal and other Stratified Minerals.

Composition and properties of coal, lignite, oil-shale, and other carbonaceous minerals.

Special geology of the carboniferous period, including details of the British coalfields and the more important foreign ones.

Geology of the liassic and oolitic iron ore formations.

Salt and gypsum deposits.

Slate and building stone strata of the United Kingdom.

Variations of character and continuity on stratified deposits, faults, heaves, slips, throws, troubles, and dislocations of all kinds. Rules for searching for faulted beds.

B.—Mineral Veins and Irregular Deposits.

Classification of mineral veins, and their relation to the containing rock or country.

Contact deposits. Relation and intersection of veins.

Direction of throw in faulted veins. Aggregates of small veins or stockworks. Strings, droppers, and cross courses. Horses, and other included masses.

Methods of occurrence of useful minerals in veins.

Composition, hardness, and density of the more abundant metallic minerals, and of the waste minerals or vein-filling.

Geographical distribution of minerals. Principal mineral districts of the United Kingdom and Colonies, Europe, and America.

2. Exploration and searching.—Appearances presented by the outcrop of coals and other stratified minerals. Relation of outcrop lines to slopes of valleys. Phenomena of backs of mineral veins. Gozzans of different lodes and their characteristic minerals. Shode and float stones. Prospecting and searching. Costeaning in new districts. Evidence afforded by surface indications of the value of old mines.

3. Breaking ground.—Various forms of wedges, hammers, and picks. Use of explosives. Hand-boring gear. Weights and dimensions of borers, drills and mallets. Forms of cutting edges. Sharpening and tempering drills. Machine borers, drills, and coal-cutting machines in their principal modifications. Cleaning, loading, and firing bore-holes. Composition of explosives. Fuzes and detonators. Electric blasting. Safety regulations for blasting. Mechanical substitutes for blasting in fiery mines.

4. Deep boring for the discovery and working of minerals.—Hand-boring tackle for shallow depths. Water-jet boring. Intermittent and continuous flushing of boring holes. Modifications of apparatus for deep holes. Free falling cutters. Rope-boring chisel and crown-boring heads. Brandt's hydraulic pressure borer. Diamond borer. Apparatus for testing perpendicularity of bore holes.

5. Details of opening ground.—Sinking, driving, and rising. Forms and dimensions of shafts and levels for different purposes. Securing ground by timber, iron, and steel. Walling and arching in brickwork and masonry. Methods of preserving timber underground. Tubbing in wood and iron for shafts in soft ground. Methods of boring and lining shafts through quicksands. Sinking by compressed air and freezing.

6. Methods of working minerals.

A.—Mines on Stratified Deposits.

Pillar and stall and long wall working in their different modifications. Square work on thick seams. Methods of working inclined thick seams with complete stowage of wastes. Working salt deposits by solution.

B.—Mines on Irregular Deposits.

Stoping overhand and underhand on lodes. Positions of winzes and passes or mills. Relative advantages of vertical and inclined shafts in mining on lodes. Methods of securing excavations on very large lodes.

7. Ventilation of Mines.—Composition of air and its associated gases. Gases given off in mine workings. Inflammable and explosive mixtures of air, fire-damp, and coal dust. Natural and artificial ventilation. Ventilation of narrow workings, levels, and drifts. Circulation of air through workings. Splitting, crossing, and regulating air currents. Stoppings, doors, and brattices. Upcast and downcast shafts. Construction of ventilating furnaces. Exhausting ventilators, rotary, bell, and piston machines. Fans of various kinds. Compressing fans and blowers. Waterfall jet machines. Körting's aspirator. Efficiency of ventilating machines. Relation of pressure to velocity in air currents. Use of the barometer, thermometer, hygrometer pressure gauge and anemometer in measuring and controlling ventilation. Gas detecting and testing apparatus.

8. Lighting of Workings.—Candles and lamps. Construction of safety lamps in their different modifications. Limits of safety in currents of high velocity. Rules for the management of safety lamps. Fleuss apparatus for exploration in irrespirable gases.

9. Underground conveyance. Construction and dimensions of tubs or trams. Underground railways and their maintenance. Hauling by men, horses, and machines. Underground engines. Compression and transmission of air to machines underground. Various methods of rope and chain traction. Self-acting, balance, and engine inclined planes.
Underground locomotives and electric railways.

10. Drawing and Winding.—Kibbles and skips in vein mines and inclined shafts. Guides of wood, iron, and wire rope in vertical shafts. Various forms of cages. Construction of pit-head frames in wood and iron. Pit ropes, in hemp, fibre, iron and steel. Weight proof, and safety loads of flat and round ropes of different materials. Examination and lubrication of ropes. Methods of attaching ropes to cages. Safety catches. Disconnecting hooks and other methods of preventing overwinding. Details of winding engines, geared and direct acting drums. Flat rope reels. Spiral drums, balance chains, and other methods of equalizing load on engine. Kope's method of winding with tail rope to cages. Winding and speed indicators.

11. Drainage of Mines.—Adit levels. Methods of raising water by kibbles and tubs. Pumps and pit work. Lifting and plunger setts. Details of pump valves. Main rods of wood, iron and steel. Safety catches and methods of counter-balancing. Pumping engines of different kinds. Water wheels, travelling rods, and bell cranks. Water pressure engines. Steam engines, direct acting and geared. Regulators of pumping engines. Cataracts. Davey's differential gear. Underground pumping engines. Combined steam and water pressure engines without rods. Pumping from distant dip workings. Pumps for acid mine water. Syphons and pulsometers. Construction of underground dams. Precautions required in driving towards drowned workings.

12. Travelling in Shafts and Levels.—Construction and arrangement of ladderways. Man engines of various kinds. Travelling in cages. Rules for ensuring safety in winding. Regulations for travelling in main waggon ways underground.

13. Surface arrangements of Mines.—Methods of landing and discharging skips in vein mines. Banking and striking arrangements in collieries. Methods of unloading tubs. Screening, picking, and loading coal.

14. Dressing of Minerals.—Principles of separating minerals by sizing and subsidence in water. Handpicking and spalling. Mechanical picking

tables. Rock breakers. Crushing rolls. Stamps. Dingey's and other pulverizers. Coal breakers. Disintegrators. Centrifugal grinding machines. Sizing sieves and drums. Hand and machine jigging processes for coal and minerals. Rittinger's and other current sizing apparatus. Slime dressing machines. Round and rotary buddles, frames, and vanners, percussion tables, blanket-strakes, labyrinth and other slime pits. Pneumatic methods of separating minerals. Special applications of magnetism to ore dressing. General succession of operations in ore and coal dressing.

15. Surveys and Plans of Mines.—Use of magnetic dial and theodolite underground. Reduction and plotting of observation. Scales and projections adopted for finished plans. Methods of determining magnetic variation.

Examination for Honours.

This being intended for testing the results of advanced study, the questions will be of such a nature as to admit of considerable detail in answering. As a rule, candidates will be expected to show a knowledge of the structure and working details of some of the coal fields and metallic mining districts, of the United Kingdom and of the more important ones of foreign countries; to be able to discuss and illustrate the details of different classes of mining machinery such as those for pumping, winding, and ventilation; the laying out, working, and management of coal and metal mines with details of working staff and economic arrangement, and the details of dressing machinery and plant required for treating particular quantities of stuff.

The paper will practically be divided into three parts :—

1. Geological and structural,
2. Mechanical,
3. Mining proper,

and answers showing proficiency in any one or two of these will be of more value than a large number of vague or short answers in all three.

SUBJECT XIX.—METALLURGY, THEORETICAL.

The examination paper will be divided into four sections :—

1. Introductory Subjects and Fuel.
2. Iron and Steel.
3. Precious Metals.
4. Metals other than the foregoing.

For a pass in the advanced stage the student will only be expected to answer questions in TWO sections, of which Section 1 (Introductory Subjects and Fuel) must be one. In order to obtain a pass in the elementary stage or a FIRST class in the advanced stage the candidate must answer questions in at least THREE sections, of which Section 1 (Introductory Subjects and Fuel) must be one. The answering in one of these two selected sections need only be such as to show a general elementary knowledge of that section. The Elementary Stage is limited to the portions of the Syllabus enclosed with brackets thus [ ]. The remaining portion of the Syllabus, excluding the portions in small capitals, constitutes the advanced stage, but in this stage questions may also be set in the portions enclosed in brackets, more advanced knowledge will, however, be demanded than is expected from an Elementary Student.

In the elementary stage no questions will be set in connexion with the following metals :—Platinum, Cobalt, Nickel, Arsenic, Antimony, and Bismuth.

For honours the examination will deal with the entire syllabus, including the portions printed in small capitals, and candidates will be asked questions at the discretion of the Examiner, who will have regard to the present state of metallurgical science as carried on in this and other countries.

In the advanced stage and for honours unlabelled specimens will be placed before the candidate. All candidates should be able to make rough but trustworthy sectional drawings and sketches of furnaces and metallurgical appliances.

SECTION I.

Introductory Subjects and Fuel.

1. [Physical Properties of Metals.—Specific Gravity. Varieties of Fracture. Malleability. Ductility. Tenacity. Toughness. Softness. Elasticity. Lustre. Colour.] Influence of impurities on physical properties.

Classification of Metallurgical Processes.

[Explanation of the terms—Ore, "native" veinstuff, or gangue, "dressing." Reduction. Smelting. Regulus. Speise. Roasting. Distillation. Sublimation. Liquation. Scorification. Amalgamation. Cupellation.]

[Slags and Fluxes, general properties of.]—Atomic constitution of silicates. [External characters, and fusibility of slags.] The fusibility of certain compounds not containing silica; aluminates, &c. Melting Points of Silicates. Economic application of slags.

[Natural Refractory Materials employed in the Construction of Crucibles, Retorts, Furnaces, &c.] Distinction between acid and basic materials. Approximate composition. Mode of testing. [Crucibles.—Graphite, black-lead, or plumbago crucibles. Lining crucibles with carbon.]

[Classification of furnaces—the modes of producing and utilizing heat in the various forms. Principle of the Siemens and other analogous furnaces. Fire Bricks.]

2. [Classification of fuel.—The calorific power of fuel.] Method of determining the calorific intensity of fuel; Theoretical Computation. [Wood.—Elementary composition of dry wood. Peat or Turf.—Composition of peat.] Approximate composition of the ashes of peat. Desiccation of peat. Coal.—Approximate composition of the ashes of coal. Lignites. Approximate composition of lignites. [Bituminous coals. Caking coal. Free burning coal. Anthracite.] Frémy's chemical Researches on combustible Minerals. [Charcoal.—Various modes of charcoal burning. Charcoal burning in piles or stacks.] Yield of charcoal by volume and by weight. Theory of Charcoal burning. Peat charcoal. [Coke.—Properties of coke. Approximate composition of coke. General principles concerning the preparation of coke. Coking in circular piles, in long piles or ridges, and in large open rectangular kilns. Coke ovens. Cox's, Appolt's, and Coppée's coke ovens.] Composition and economic Application of the waste Products of Coke Ovens. Simon-Carve's Coke Oven. Coking of non-caking coal slack by admixture with pitch. Desulphurization of coke. Combustible Gases evolved during coking.

Comparison of Fuels in regard to Calorific Power. Evidence as to Value of a Coal afforded by Distillation in a closed Vessel. The various forms of Pyrometer.

SECTION II.

Iron and Steel.

3. [Physical] and Chemical [properties]. Preparation of pure iron by Electrolysis. [Welding. "Burnt Iron."] Oxides of Iron.—Action of Carbonic Oxide and Hydrogen on Oxides of Iron at varied Temperatures in presence of Carbonic Acid and Water. [Iron scale, or hammer slag.—Preservation of iron from rust. Sulphides of iron roasted with access of air.] Iron and Nitrogen. Passivity of Iron. [Iron and Phosphorus.]—On the action of Carbon on Iron containing Phosphorus. On the action of Iron at a high Temperature upon Phosphate of Lime in the presence of Carbon. Ditto in the presence of carbon and free silica. Manganese and Silicon. Iron and Silicon.—Reduc-

tion of silica by carbon in the presence of oxide of iron and other bases. Protoxide of iron and silica. [Reduction of silicate of protoxide of iron by carbon.] SILICATE OF SESQUIOXIDE OF IRON. TRIBASIC SILICATE OF PROTOXIDE OF IRON HEATED WITH ACCESS OF AIR. LIQUATION OF SILICATE OF PROTOXIDE OF IRON CONTAINING PHOSPHORUS.

[Iron and Carbon.—Modes of effecting the combination of carbon with iron Cementation.] ACTION OF CARBONIC OXIDE UPON IRON. ACTION OF SOLID CARBON UPON IRON. IN AN ATMOSPHERE OF CARBONIC OXIDE. IN AN ATMOSPHERE OF HYDROGEN. [Amount of carbon in iron.] Maximum amount of carbon capable of being taken up by pure iron. IRON, MANGANESE, AND CARBON. Modes of existence of carbon in iron, grey, white, and mottled cast iron, steel. Chill-casting. Spiegeleisen, or specular cast iron. ACTION OF SILICON AND OF SULPHUR ON IRON CONTAINING CARBON. ABSTRACTION OF SILICON FROM CAST IRON BY FUSION WITH SESQUIOXIDE OF IRON ALONE, AND WITH THE ADDITION OF MANGANESE. ACTION OF DILUTE SULPHURIC OR HYDROCHLORIC ACID ON WHITE AND GREY CAST IRON. Influence of phosphorus, carbon, silicon, sulphur on iron.—["Red and cold, shortness."]

Alloys of Iron.—Process for zincing or galvanizing iron. STERRO-METAL. IRON AND TIN; TITANIUM; CHROMIUM; TUNGSTEN.

[Ores of Iron.—Classification and metallurgical value of:—Physical properties and chemical composition of.]

ASSAYING OF IRON ORES BY DRY AND WET METHODS.

[Direct Extraction of Iron in the Malleable State from the Ore.—Primitive appliances. Catalan Process; trompe, or blowing machine.] Its advantages and disadvantages. Theory of the process. CONDITIONS AFFECTING THE QUALITY OF THE IRON PRODUCED. Characters of the iron produced. Stückhofen or High Bloomery Furnace. CLAY'S PROCESS. CHENOT'S PROCESS. SIEMENS' PROCESS AND BLAIR'S PROCESS. [Indirect Extraction of Iron in the State of Cast Iron from the Ore.—Description of the modern blast furnace; foundation, hearth, twyer openings, twyers, tunnel head, bracing, blast main, and blast pipes.] BLAST ENGINES. CHEMICAL PHENOMENA OF THE MODERN BLAST FURNACE. [Hot Blast.]—Neilson's patent. [Apparatus for heating the blast. Syphon pipe.] GAS OVEN. Cowper's and Whitwell's stoves. THEORY OF THE HOT BLAST. Saving of fuel. WATER-TWYERS. [The Gases of Iron-smelting Blast Furnaces.]—Composition of the gases of the Furnace. PRODUCTION OF CYANOGEN IN THE BLAST FURNACE [Utilization of the gases escaping from blast furnaces. "The waste gas." Modes of taking off the gases with open-mouthed and with closed mouthed furnaces.] The best form of the blast furnace. RATIOS OF HEIGHT TO DIAMETER. Decrease in volume which the materials undergo during their descent. RECTANGULAR OR RACHETTE FURNACE. BLOWING IN A BLAST FURNACE. [Tapping.] Derangements in the working, scaffolding, and slips. Loss of iron in the slag. INDICATIONS AFFORDED BY COLOUR OF SLAGS. ACCIDENTAL PRODUCTS OF BLAST FURNACES. CYANONITRIDE OF TITANIUM. GRAPHITE OR KISH. Reduction of phosphoric acid in the blast furnace, and passage of the phosphorus into the pig iron. SUBSTITUTION OF LIME FOR LIMESTONE AS A FLUX. Yields of blast furnaces.

[Various kinds of Pig Iron.]

[Production of Malleable Iron from Cast Iron.]—South Welsh process; the hollow fire. Swedish Lancashire Hearth; WALLOON PROCESS, AS CONDUCTED IN SWEDEN. [Slags or cinders produced in finery processes. Running out fire or refinery; composition of refined iron; ditto refinery slags or cinders. Puddling; pig boiling and dry puddling furnace. Invention of iron bottoms; manipulation;] theory of the process; [composition of tap cinder;] MECHANICAL PUDDLING. APPLICATION OF WASTE BLAST FURNACE GAS TO PUDDLING. SIEMENS' GAS PUDDLING FURNACE; PRINCIPLE OF THE FURNACE. THE GAS PRODUCERS. [Working of the Ball.—Forge hammers; tilt hammers. Helves or lift hammers.] STEAM FORGE HAMMERS. [Squeezers; Puddling or puddle rolls.] COMPOSITION OF PUDDLED BARS. [Working of the Puddled Bar into Merchant or Finished Iron.—Reheating furnace; with coal as fuel.] With gaseous fuel, or gas-welding furnace.

[Piling.] YIELD OF PUDDLED AND FINISHED IRON. Manufacture of rails. COMPOSITION OF THE CINDER FROM THE REHEATING FURNACE.

[Varieties of Sheet Iron and Slit Rods.—Tin plates. Charcoal plates.] COKE PLATES. BELGIAN SHEETS. RUSSIAN SHEETS. SWEDISH IRON. DANNEMORA IRON. ARMOUR PLATES; ROLLED; HAMMERED.

[Classification of processes for production of Steel.—Carburization of bar iron. Converting furnace.] CARBURIZATION BY GASEOUS COMPOUNDS OF CARBON. [Carburization by fusing compact iron with carbonaceous matter;] WOOTZ. Siemen's-Martin process. IMMERSION OF MALLEABLE IRON IN MOLTEN CAST IRON. Theories of the carburization of iron.—[Bessemer process. Description of the apparatus.] Basic and acid linings how prepared, reactions in the process, how adapted for iron containing much phosphorus. PREPARATION AND USE OF SPIEGELEISEN AND FERRO-MANGANESE. [Casting of Steel.—Furnaces and crucibles. Fusion of steel in the reverberatory furnace.] THE ADDITION OF MANGANESE IN THE CASTING OF STEEL. Manipulation of Steel.—THEORY OF HARDENING AND TEMPERING STEEL. Welding steel. Shear steel. ESTIMATION OF PHOSPHORUS, SULPHUR, CARBON, AND SILICON IN IRON AND STEEL.

SECTION III.—THE PRECIOUS METALS.

GOLD.

4. [Physical] and CHEMICAL [properties]. Impurities in gold; lead, arsenic, antimony. ACTION OF CHLORINE ON TERSULPHIDE OF GOLD. [Gold and chlorine.] Action of oxalic acid, and of sulphate of protoxide of iron on solutions of chloride of gold.

[Alloys of gold.]—

USE OF THE TOUCHSTONE. DEFINITION OF THE TERMS "STANDARD" AND "CARAT."

Ores of Gold.—VARIOUS METALLIFEROUS MINERALS CONTAINING GOLD.

ASSAYING OF ORES AND ALLOYS OF GOLD BY DRY AND WET METHODS.

[Classification of methods of Extraction.—Amalgamation of quartz containing gold; apparatus employed, mode of working, nature of the products, and method of extracting the gold from the amalgam.] PLATTNER'S PROCESS BY CHLORINE. BRUCKNER'S CALCINER. PAN AMALGAMATION. "SWEEP" REFINING. Electro-deposition.

Classification of wet and dry methods for the separation of Gold from Silver and Copper. Methods of working, chemical reactions.—Apparatus. ["Parting." Miller's process for refining gold containing silver, by chlorine.] Electro "parting" and Electro-plating.

SILVER.

5. [Physical] and CHEMICAL [properties]. [Action of heat, of heat and air, and of acids upon silver. Silver and Oxygen.] [Sulphide; physical and chemical properties of. Modes of formation. Action of heat. Action of heat and air.] Action of heat and air in the presence of other metallic sulphides. ACTION OF HYDROGEN OF STEAM, of acids, of nitre, of iron, of lead, OF COPPER, AND OF MERCURY UPON SULPHIDE OF SILVER. [Combination with other sulphides.] "OXIDIZED SILVER" PROCESS. [Sulphate; physical and chemical properties. Mode of producing. Action of heat. Action of chloride of sodium.] SOLUBILITY IN WATER. Action of hyposulphite of soda on chloride of silver. [Nitrate; physical and chemical properties. Action of heat. Method of separation from nitrate of protoxide of copper. Silver and Chlorine. Chloride; physical and chemical properties. Methods of formation by dry and wet processes. Methods of reduction by carbonate of soda and by zinc. ACTION OF HYDROGEN, [of acids, of chloride of sodium,] OF CYANIDE OF POTASSIUM, COPPER, MERCURY, [of sulphur, of metallic sulphides, and of protoxide of lead upon chloride of silver].

[Alloys of Silver.]—Levol's Alloy, Liquation of Alloys.

[Ores of Silver.]—Nature of metalliferous Minerals containing Silver.

Assaying of Ores and Alloys of Silver by the dry and wet Methods.

[General classification of methods of Extraction, wet and dry.—Extraction of silver from argentiferous copper: Liquation process, or description of furnace. Mode of operation. Nature of the products. Extraction of silver from the ore: Mexican amalgamation process.—Apparatus employed, materials used, method of working, nature of the products.] Chemical Principles involved. Specialities of the Process. [Working of the silver amalgam.] Application of Copper Amalgam. Loss of Silver in the Process. Cazo Process. Freiberg amalgamation process.—Description of furnaces and apparatus. Stetefeldt Calciner. Mode of working and chemical Principles involved. Composition of Silver Amalgam. Amalgamation of argentiferous Speise. Amalgamation of argentiferous Copper Regulus. [Extraction of silver from argentiferous regulus: Ziervogel's process.—Description of the furnaces and apparatus employed, and chemical reactions involved in the various operations.] Specialities of the Process. [Augustin's process.—Description of the process and chemical principles involved.] Von Patera's Method. —Apparatus used, Materials employed, Products obtained, and chemical Reactions in the Process. [Extraction of silver from ore by means of lead]: Furnaces used, method of working, nature of the products. Chemical Composition of the Products and chemical Reactions involved. Electro-plating.

Platinum.

6. Physical and chemical properties of the metal.
Ores of Platinum.—Native platinum. Physical characters. Metals occurring in. Minerals associated with.
Methods of Extraction.—Wet method. Deville's method. Melting of platinum. Working of Platinum. Electro-plating.

SECTION IV.—METALS OTHER THAN THE FOREGOING.

Copper.

7. [Physical] and chemical [properties]. Impurities in copper. [Dioxide; protoxide. Disulphide. Disulphide of copper heated with access of air. Disulphide of copper heated in admixture with dioxide, protoxide, or sulphate of copper. Dioxide of copper heated with protosulphide of iron and silica. Disulphide of copper heated with carbon, and iron. Copper and dioxide of copper. Copper and carbon. Overpoled copper.] Copper and nitrogen. Copper and phosphorus. Influence of various Foreign Matters on Electric Conductivity.
[Ores of Copper.—Characters and chemical composition of.]

Assaying of Copper Ores by dry and wet Methods.

[Copper Smelting.—The Welsh Process.—Furnaces employed. The reactions which occur in the process. Calcination;] Composition of the gaseous Products which escape from the Ore-Calciner. Utilization of sulphurous acid. Gerstenhoffer's Calciner. [Melting of the calcined ore; external characters, and composition of coarse metal and ore-furnace slag. Calcination of the granulated coarse metal; Melting of calcined granulated coarse metal; white metal, blue metal, metal-slag. Moss-copper. Roasting; blister-copper, roaster-slag.] "Best selected" process. [Refining.] Elimination of the following Foreign Metals during the Welsh Process of Copper Smelting.—Arsenic, Antimony, Tin, Nickel, Cobalt, Gold, and Silver. Muffle Furnaces. Copper smelting in

Blast Furnaces: In Sweden.—Furnaces employed; ore-furnace, black copper furnace, refining hearth. Loss in smelting. SMELTING OF COPPER SCHIST IN PRUSSIAN SAXONY. COPPER SMELTING IN PERM IN RUSSIA. CUPRIFEROUS PIG IRON. THEORY OF THE PROCESS. KERNEL-ROASTING AT AGORDO.—COMPOSITION OF THE ORE. THEORY OF THE PROCESS. Wet methods of extracting copper. Electro-deposition and purification of copper.

ZINC OR SPELTER.

8. [Physical] and CHEMICAL [properties]. Impurities in commercial zinc. ACTION OF CARBONIC ACID AND CARBONIC OXIDE ON METALLIC ZINC AND OXIDE OF ZINC. [Reduction of oxide of zinc by carbon, carbonic oxide, and hydrogen.] SILICATES OF ZINC. REDUCTION OF SILICATE OF ZINC BY CARBON. [Sulphide of zinc heated with access of air,] with oxide of zinc, and WITH CARBON.

[Ores of Zinc.—Physical character and chemical composition of.]

METHODS OF ASSAYING ORES OF ZINC.

[Methods of Extracting Zinc.—English Process.—Roasting or calcination of the blende.] TREATMENT OF THE ROUGH ZINC. [Silesian Process.—Retorts and appendages. Description of the furnace.] Calciner. Distillation of zinc. [Melting of distilled zinc. Belgian Process.—Retorts and appendages. Description of the furnace.] ZINC FUME. PROPOSED IMPROVEMENTS IN THE EXTRACTION OF ZINC. Electro-deposition and purification of zinc.

[Brass.—Physical properties of various alloys of copper and zinc.] Direct preparation of brass. [Muntz's metal.] Defects occurring in brass.

LEAD.

9. [Physical] and CHEMICAL [properties]. [Action of heat. Autogenous soldering. Action of air, of water], OF CARBONIC ACID, OF DIOXIDE OF COPPER, AND OF ACIDS UPON LEAD. [Protoxide; mode of formation by dry] and WET [methods]. [Action of carbon,] OF HYDROGEN, AND OF CARBONIC OXIDE. [Fusibility with metallic oxides.] ACTION OF METALS WHEN HEATED WITH PROTOXIDE OF LEAD. [Red lead. Action of heat and air upon sulphide of lead.] ACTION OF PROTOXIDE OF LEAD ON PEROXIDE OF IRON AND CARBON, and of [iron, when heated with sulphide of lead]. [Action of metallic lead on sulphide of silver. Combination of sulphide of lead with other sulphides. Sulphate.—Action of carbon, of iron, of lead, of protoxide of lead, and of sulphide of lead, on sulphate of lead.]

[Alloys of Lead.—Lead and antimony; arsenic; zinc;] COPPER; MERCURY; GOLD; [silver].

[Ores of Lead.—Physical character and chemical composition of.]

METHODS OF ASSAYING LEAD ORES.

[Extraction of Silver from Lead.—Pattinson's process.]—THEORY OF THE PROCESS, [methods of working, description of the apparatus] and mechanical appliances. LIMIT OF CONCENTRATION. EFFECT OF FOREIGN METALS. [Parkes' process.]—Methods of working. PRINCIPLES INVOLVED. [English process of cupellation.—Construction of furnace, mode of conducting the process, nature of the products], CHEMICAL COMPOSITION OF THE PRODUCTS AND CHEMICAL REACTIONS INVOLVED. German process of cupellation.—Description of furnace, mode of conducting the process, nature of the products and CHEMICAL COMPOSITION OF PRODUCTS. Refining of "Blicksilber."—In open test. Under a muffle. Desilverisation of lead by electrolysis.

[Extraction of Lead from the Ore.—Classification of processes and general chemical reactions. Flintshire furnace.—Description of the furnace, nature of the products.] ACTION OF LIME. Brittany furnace.—process. Spanish reverberatory furnace.—Description of and mode of working. [Cornish process.—Description of "calciner" and of "flowing furnace" process. Nature of the products.] CHEMICAL COMPOSITION OF THE PRODUCTS. ACTION OF IRON. [Ore hearth.—Construction of the furnace, method of working, and nature of the products.] AMERICAN ORE HEARTH. PECU-

MARITY. ADVANTAGES. Roasting and deoxidizing process: Swedish process.—Nature of the ores, description of the furnace, mode of working, and nature of the products. Freiberg process.—Description of the furnaces, method of working, and nature of the products. ACCESSORY PRODUCTS. COMPOSITION OF THE PRODUCTS. Pontgibaud process.—Description of the ore, roasting and blast furnaces, mode of working, and nature of the products. CHEMICAL REACTIONS INVOLVED. German method with basic silicate of protoxide of iron.—Description of the Rachette furnace. Electro-deposition and purification of lead.

Condensation of Lead Fumes.—Description of the various methods and apparatus employed. Physical characters AND CHEMICAL COMPOSITION of lead fume. Treatment of lead fume.

[Softening of Hard Lead.—Principle. Liquation of hard lead.]

[Reduction of Litharge.—]

[Manufacture of Red Lead.—]

Miscellaneous Details.—Varieties of lead in commerce. METHODS OF TESTING FOR METALS PRESENT IN LEAD. CAST SHEET LEAD. Lead suitable for pipes, sulphuric acid chambers, red lead and whitelead. POISONING BY LEAD.—SYMPTOMS OF POISONING. PREVENTIVE MEASURES.

TIN.

10. [Physical] and CHEMICAL [properties of the metal]. [Action of heat of air, of heat and air], and OF ACIDS [upon the metal]. ACTION OF TIN ON VARIOUS METALLIC OXIDES.

[Alloys of Tin.—]

[Ores of Tin.—"Stream tin." "Mine tin." "Wood tin."] MINERALS OCCURRING WITH TIN ORES.

ASSAYING OF TIN ORES.

[Smelting of Tin Ores.—In reverberatory] and blast [furnaces].—[Description of furnaces used, methods of working, nature of the products,] CHEMICAL COMPOSITION OF THE PRODUCTS, AND CHEMICAL REACTIONS INVOLVED. [Refining of tin.] OXLAND'S PROCESS.

[Commercial Varieties of Tin.—Common tin. Refined tin. Grain tin. Block tin.] FOREIGN METALS OCCURRING IN TIN. METHODS OF TESTING FOR FOREIGN METALS. Electro-deposition. Electro-plating.

MERCURY.

11. [Physical] and CHEMICAL [properties]. [Action of heat, of air,] OF ACIDS, AND OF CHLORINE [upon Mercury].

[Protosulphide or vermilion]; methods of preparation, [physical] and CHEMICAL [properties. Action of heat, of heat and air,] OF HYDROGEN, [of iron, of lime,] OF ALKALIES, OF CHLORINE, AND OF ACIDS UPON PROTOSULPHIDE.

[Amalgams.—Mercury and silver; gold; copper]; IRON; sodium.

[Ores of Mercury.]—NATURE OF MINERALS CONTAINING MERCURY.

METHODS OF ASSAYING OF ORES OF MERCURY.

[Methods of Extraction.—Description of furnace, method of operation, nature of the products,] and CHEMICAL REACTIONS INVOLVED in the following methods: HUANACAVELICA PROCESS. ALMADEN PROCESS. IDRIAN PROCESS. Alberti process. Hähner's furnace process. GALLERY FURNACE PROCESS. FAHLORE PROCESS.

IMPURITIES PRESENT IN MERCURY. METHODS OF TESTING MERCURY FOR FOREIGN METALS. Modes of purifying commercial varieties of mercury.

COBALT.

12. Physical and CHEMICAL properties of the metal. METHODS OF PREPARATION. Protoxide; mode of formation, physical and CHEMICAL properties. ACTION OF HYDROGEN. Physical and CHEMICAL properties and mode of producing the compounds of cobalt and arsenic.

Ores of Cobalt.—NATURE OF MINERALS CONTAINING COBALT.

METHODS OF ESTIMATING COBALT.

Cobalt products.—Smalts; mode of preparation. Apparatus used. Nature of the products. CHEMICAL COMPOSITION OF THE PRODUCTS. CHEMICAL PRINCIPLES INVOLVED in the manufacture. Uses of smalts and oxide of cobalt. Silicate of protoxide of cobalt; mode of obtaining. Printers' blue.

Alloys of Cobalt.

NICKEL.

13. Physical and CHEMICAL properties of the metal. Physical and CHEMICAL properties and mode of obtaining compounds of nickel and sulphur. Physical and CHEMICAL properties of the compounds of nickel and arsenic. Nickel speise; CHEMICAL COMPOSITION. ACTION OF HEAT AND AIR UPON ARSENIDE OF IRON, COBALT, AND NICKEL. Nickel and carbon.

Alloys of Nickel.—German silver; mode of preparation, physical characters and composition of the commercial varieties.

Ores of Nickel.—Physical characters and CHEMICAL COMPOSITION of: NATURE OF OTHER MINERALS CONTAINING NICKEL. METEORIC IRON.

METHODS OF ASSAYING NICKEL ORES.

Methods of Extraction.—Apparatus employed, mode of working, nature of the products, and CHEMICAL REACTIONS INVOLVED.

Commercial varieties of nickel. FOREIGN METALS OCCURRING IN NICKEL, Electro-deposition. Electro-plating.

ARSENIC.

14. Physical and CHEMICAL properties. Action of heat, and of heat and air upon the metal. Physical and CHEMICAL properties, and methods of preparation of the compounds of arsenic and oxygen. Action of carbon, of HYDROGEN, and of CARBONIC OXIDE UPON ARSENIOUS ACID. Physical and CHEMICAL properties, and methods of obtaining the compounds of arsenic and sulphur.

Ores of Arsenic.—NATURE OF MINERALS CONTAINING ARSENIC.

METHODS OF ESTIMATING ARSENIC.

Methods used for obtaining White Arsenic.—Description of apparatus, methods of working, nature of the products and CHEMICAL REACTIONS INVOLVED. Methods of refining white arsenic; description of apparatus, mode of working, and nature of products. Preparation of metallic arsenic.

Applications of arsenic and its various compounds.

ANTIMONY.

15. Physical and CHEMICAL properties of the metal. Tersulphide; methods of formation. Physical and CHEMICAL properties. Action of heat, or of heat and air, OF STEAM, of carbon, of nitre, and of iron upon the sulphide of antimony.

Alloys of Antimony.—Antimony and lead. Composition of type metal and stereotype metal. "REGULUS OF VENUS." Hardening effect of antimony on alloys.

Ores of Antimony.—Physical characters and CHEMICAL COMPOSITION OF: NATURE OF MINERALS CONTAINING ANTIMONY.

ASSAYING OF ORES OF ANTIMONY.

Methods of Extraction.—Apparatus used, methods of working, nature of the products. CHEMICAL COMPOSITION OF THE PRODUCTS, and CHEMICAL REACTIONS INVOLVED in the following methods:—Liquation process. Reduction by iron, English process. French method.

FOREIGN METALS OCCURRING IN ANTIMONY. METHODS OF TESTING FOR FOREIGN METALS.

Bismuth.

16. Physical and CHEMICAL properties. Tersulphide; methods of formation. Physical and CHEMICAL properties. Action of heat. ACTION OF METALS WHEN HEATED WITH TERSULPHIDE OF BISMUTH.

Alloys of Bismuth.—

Ores of Bismuth.—Names of various minerals containing bismuth.

METHODS OF ESTIMATING BISMUTH.

Methods of Extraction.—Apparatus used. Description of processes, AND CHEMICAL ACTIONS INVOLVED IN THE VARIOUS METHODS.

FOREIGN METALS OCCURRING IN BISMUTH. METHODS OF TESTING FOR FOREIGN METALS.

SUBJECT XIX. *p.*—METALLURGY, PRACTICAL.

FIRST STAGE OR ELEMENTARY COURSE, AND SECOND STAGE OR ADVANCED COURSE.

In the elementary stage a practical examination will test the candidate's knowledge of:—

(*a.*) The principles on which "calcination," "roasting," and "reduction" are based.

(*b.*) The testing of fire-resisting materials.

(*c.*) The preparation of common alloys, such as pewter, brass, and bronze, and:—

(*d.*) Subjects dealt with in those portions of the Syllabus enclosed in brackets, thus [ ].

In the advanced stage the candidate will be required to conduct at least two of the operations enumerated in this syllabus on materials which will be supplied to him.

FUEL.—[Evidence as to the value of a coal afforded by distillation in a closed vessel.] Determination of the amount of ash and sulphur in fuel.

Determination of the calorific power of coal with the aid of Thompson's calorimeter.

REFRACTORY OR FIRE-RESISTING MATERIALS.—The student should prepare for himself small clay crucibles from a material consisting of two parts, by measure, of unburnt to one part of burnt Stourbridge clay, some of these crucibles being lined with a mixture of charcoal powder and treacle. Cupels of bone ash must also be prepared.

[Testing of fire-clay and crucibles with a view to ascertain, 1st, their capability of sustaining a high temperature; and, 2nd, their power of resisting the corrosive action of fused metallic oxides.]

GENERAL PROPERTIES OF FLUXES.—The fusibility and external characteristics of various silicates.

METHODS ADOPTED IN THE EXTRACTION OF METALS FROM THEIR ORES.

ROASTING: [conversion of metallic sulphides into oxides and sulphates by roasting in the muffle furnace, especially sulphides of copper, lead, silver, and zinc.] Experimental solution of problems involved in roasting complex mixtures of metallic sulphides.

Estimation of the amount of compounds soluble in water produced by roasting certain mixtures of metallic sulphides.

REDUCTION.—[The reduction of oxide of iron will be best taught in this stage by the heating of hæmatite in the small clay crucibles or in crucibles lined with charcoal, suitable fluxes and reducing agents being added. The

student must be taught to recognise, from the fracture of the button, the variety of iron produced.]

[Reduction of sulphide of lead], [(1) by the mutual action of the sulphide on the oxide;] and (2) by the action of sulphide and sulphate.

[Reduction of copper from sulphide by the action of the sulphide on the oxide of copper. In these cases the mixture is so adjusted that the relation between the sulphur and oxygen shall be the same as in sulphurous anhydride.]

[Reduction of the sulphide of lead] and of sulphide of antimony [by metallic iron].

[Cementation (oxidizing and carburizing).—The leading effects that attend, (1) the prolonged heating of thin pieces of cast iron in hæmatite; and (2) the prolonged heating of wrought iron in charcoal.]

The production of steel may also be studied by fusing wrought and cast iron together in suitable proportions.

Amalgamation.—Action of metallic mercury when triturated with metallic silver, artificially prepared sulphide of silver, and chloride of silver: separation of each amalgam so formed; its concentration by squeezing in leather, and subsequent distillation.

Liquation.—Separation of the native sulphide of antimony from its gangue.

Separation of argentiferous lead from an alloy of 50 per cent. lead and 50 per cent. copper, by heating a disc of the alloy somewhat above the melting point of lead, so that the more fusible metal can flow away, leaving an impure sponge of copper behind.

[Cupellation.—The general features of the enrichment of argentiferous lead by scorification in a muffle with subsequent separation of the silver by cupellation on a bone ash cupel.]

Determination of the amounts of lead required to effect the removal by cupellation of small and varying amounts of copper alloyed with silver.

Chlorination.—Formation of chloride of gold by the action of chlorine gas on finely divided gold. Solution of the chloride in water, and the precipitation of the gold by ferrous sulphate. Preparation of chloride and of sulphate of silver. Solution of the chloride of silver in brine, and separation of the metal from solution by metallic copper. Separation of the silver from the sulphate by the action of metallic copper.

Treatment of copper pyrites by roasting with common salt, and subsequent extraction of the soluble chloride of copper by water.

Treatment of pyrites mixed with sulphide of silver by roasting with common salt, and estimation of the amount of silver that has been converted into chloride as shown by the solvent action of hyposulphite of sodium.

Treatment of auriferous iron pyrites by roasting with salt; conversion of the compound so formed into finely divided gold by an elevation of temperature, and subsequent conversion of the gold into chloride soluble in water, by the action of chlorine gas. Recovery of the gold from solution by precipitation with ferrous sulphate.

Purification of Metals.

Wet Methods.—Separation of copper alloyed with silver and gold by "parting" with sulphuric acid, recovery of the silver from solution by metallic copper, and of the copper from the sulphate of copper so formed by metallic iron. [This will be useful to the student as showing the replacement of a metal in solution by a cheaper one.]

Separation of gold from silver by "parting" with nitric acid; recovery of the silver by precipitation as chloride, and its subsequent reduction to the metallic state by zinc or iron.

Dry Methods.—[Refining copper by oxidizing and "poling" commercial copper melted in a crucible. The student should make himself familiar with the characteristics of the ingot of metal in the three states known as:—1, "dry copper"; 2, "tough copper"; 3, "overpoled."]

Alloys.

[It will be well, in the first instance, to cause the student to prepare alloys of which the chemical, physical, or mechanical properties differ widely from those of their constituent metals, and to direct them to ascertain, so far as the facilities of the laboratory will permit, that the alloys so prepared correspond with the descriptions usually given of them. Such alloys would be (1) of the copper-zinc series, one or more kinds of brass; (2) of the copper-tin alloys, speculum metal and gun metal; (3) of the tin-lead (with or without other metals, fusible metal). They should also prepare the "regulus of Venus" (copper and antimony in equal parts by weight), and they should be shown that an alloy of equal parts by weight of lead and zinc will separate into two nearly distinct layers when slowly cooled from fusion, and that tin with a small per-centage of arsenic resembles zinc.]

Honours.

For honours the candidate will be required to take up an analysis or a metallurgical operation already in progress and complete it.

In addition to the subjects indicated in the advanced stage, the student must be able to make a complete analysis of cast iron or steel, estimating the total carbon by combustion and the combined carbon by Eggertz method. The sulphur and phosphorus may be determined by any of the well-known methods, but the student should be familiar with the respective advantages of the different methods in use.

The reduction of metallic oxides by carbon and by carbonic oxide should be carefully studied, as well as the action of carbonic oxide on precipitated ferrous oxide at varied temperatures from 150° C., and the inverse action of carbonic anhydride on metallic iron at a red heat.

In addition to the "wet methods" before mentioned, the various "wet methods" for separating nickel and cobalt should be taught.

The student must also be able to prepare chemically pure gold and silver.

Note.—No candidate who does not pass the practical as well as the theoretical examination can obtain a medal or full certificate in Honours. *See* Science, sec. 46 & 48, page 40.

Laboratory for Practical Metallurgy.

In most cases comparatively small additions to the Chemical Laboratories, arranged and furnished in accordance with the prescribed regulations (*see* page 204), will enable Practical Metallurgy to be taught.

It is necessary that a wind furnace should be provided and this furnace should be in connexion with a flue at least 30 feet high. The furnace may be placed in a basement below the laboratory, but there is no objection, if space permits, to its being in the laboratory.

There must also be a muffle furnace capable of heating to bright redness a muffle at least 8 inches long, 4 inches wide, and 3 inches high; when there is an abundant supply of gas, gas muffle furnaces may be adopted with advantage.

No more than three candidates will be allowed to use the same muffle furnace at any examination in Practical Metallurgy.

The muffle furnace may be in the laboratory, as it is also useful in conducting various chemical operations.

Each student should be provided with the tools and appliances set forth in List I., and those named in List II. must be kept in the laboratory for the use of the students.

List III. gives the reagents, fluxes, &c. that will be required by the students for general use.

No student should be allowed to enter for the practical course in Metallurgy who has not already passed in the Elementary Stage of Subject X. (Inorganic Chemistry, Theoretical).

List I.

Each student in the Advanced Stage and Honours must be provided with the following articles. In the Elementary Stage the student need only have the articles that are marked with an asterisk :—

*1 small hammer.
1 small anvil.
1 drill.
*1 steel spatula.
*1 camel hair brush.
*1 hard tooth brush.
2 sheets of glazed paper.
*1 pair of scissors.
1 pair of pliers—half round, taper.
1 pair brass forceps.
*1 triangular file.
*1 wire triangle—covered.
2 glass rods.
1 glass funnel, 3 inches diameter.
4 beakers, Nos. 5, 6, 7, and 8.
1 washing bottle, fitted.
2 conical flasks and small funnels.
1 Bohemian flask, 24 oz.
1 Berlin evaporating dish, No. 7.
1 do. No. 2, 3½ inches diameter.
*1 porcelain mortar.
*1 porcelain crucible, 1½ inch diameter.
1 packet of filters, 5½ inches diameter or filtering paper.
6 test tubes.
2 feet combustion tubing.
1 lens.
*6 scorifiers, 2½ inches diameter.
*12 cupels.
*6 earthen crucibles, each size, 1¾, 2½, and 3 inches diameter.
*1 black lead crucible, 3 inches diameter.
*2 roasting dishes, 3 inches diameter.
*1 duster or cloth.
*1 note book.
½ oz. silver, or old or foreign silver coin.
2 dwts. gold, or old or foreign gold coin.

List II.

The following must be kept for general use :—

3 pairs of furnace tongs.
1 open ingot mould.
1 ingot mould with hemispherical cavities.
1 copper scoop.
1 cupel mould.
1 mould for making small clay crucibles.

List III.

The following metals and reagents, which need not be of a high degree of purity, must be kept in addition to the ordinary stock of a Chemical Laboratory.

Antimony.
Arsenic.
Bismuth.
Copper.
Iron.
Lead (in thin sheet free from silver).
Mercury.
Tin.
Zinc.
Charcoal.
Sulphur.
Antimony Sulphide (black).
Bismuth Oxide.
Copper Oxide (black).
Copper Sulphate.
Cobalt Oxide.
Iron Oxide.
Lead Oxide.
Lead Sulphate.
Manganese Oxide (black).
Mercury Sulphide (red).
Nickel Oxide.
Tin Oxide.
Zinc Oxide.
China Clay.
Glass Powdered.
Lime.
Salt.
Clay.

SUBJECT XX.—NAVIGATION.

First Stage or Elementary Course.

General Notions and Definitions.—Figure of the earth; diameters of the earth; axis, poles. Equator or equinoctial line; meridians; first meridians; parallels of latitude. Latitude; longitude; difference of latitude; difference of longitude. Rhumb line; course; nautical distance; meridian distance; departure.

Examples of differences of latitude and differences of longitude to prove that the meridian distance is equal to the difference of longitude multiplied by cosine of latitude. Examples; having given any two of these to find the third.

The Compass.—Description; Points. Number of degrees, minutes, and seconds in a point, $\frac{1}{4}$ point, $\frac{1}{8}$ point, $\frac{1}{16}$ point. To reduce points and parts of points into degrees, minutes, and seconds, and conversely.

Variation of the Compass: easterly, westerly. How to be allowed (1), when it is required to find the true from compass course; (2), to find compass course from true.

Deviation.—How the amount of local deviation is ascertained practically; how allowed. Examples of correction of courses for variation and deviation.

Leeway.—Definition. Starboard tack, port tack, close-hauled. How leeway is to be allowed. Examples.

The Log.—Description. How divided. Ordinary and patent.

Sounding.—Instruments used for.

Plane Sailing.—Construction of figures. Proof of formulæ used in plane sailing, viz., connecting nautical distance, difference of latitude, departure and course. Examples.

Traverse Sailing.—Definition of a traverse. To resolve a traverse. Construction of traverse table. Examples.

Middle Latitude Sailing.—To prove the formulæ used. Examples.

Second Stage or Advanced Course.

Mercator's Projection and Chart.—Principle, use, and advantages. Proofs of rules used in Mercator's sailing. Examples.

Deviation.—Sub-permanent and induced magnetism. Laws of induced magnetism in a ship. Semicircular and quadrantal deviation. Description of modes for ascertaining the amount of deviation.

Great Circle Sailing.—Given the latitude and longitude of two places, to find the distance between them on a great circle. To find the latitude and longitude of the vertex. To find a succession of points on a great circle between two places. Examples.

Errors to which the log is liable. Having given the apparent distance run with given known errors in log line and glass, to find the true distance.

To find the difference of longitude made on a traverse. Taking a departure. Log-board and log-book. Day's work. Examples.

Examination for Honours.

In addition to the above, will be required :—

Calculation of Tables.—(*a.*) Traverse tables.
(*b.*) Meridional parts.

Mercator's Chart.—Practical construction.

Magnetism of Ships.—Full knowledge of determination of co-efficients A B C D E. Heeling error. Compensation of compasses. Napier's graphic method.

Nautical Surveying.—Problems in, not requiring a knowledge of nautical astronomy.

Cyclones.

SUBJECT XXI.—NAUTICAL ASTRONOMY.

First Stage or Elementary Course.

Definitions in Nautical Astronomy.

Time.—Civil and astronomical. Apparent and mean solar; to convert the one into the other. Conversion of arc into time and time into arc. Greenwich date.

Equation of Time.—General account of, and use.

Explanation and use of the Nautical Almanac, so far as is necessary for finding the latitude and longitude from observations of the sun.

The Sextant.—Construction and use of, with its adjustments.

Chronometer.—Use of; error and rate.

Corrections of Altitude.—Causes and general description of, and use of tables.

To prove the rules and work examples in the following problems :—

1. To find the latitude by meridian altitudes of the sun.
2. To find the longitude by chronometer and altitude of the sun.
3. To find the error of chronometer by a single altitude of the sun.
4. To find the variation of the compass—
   (*a.*) By amplitudes of the sun.
   (*b.*) By altitude-azimuth.

Second Stage or Advanced Course.

Time.—Sidereal time. To convert intervals of mean into sidereal time, and vice versâ. Meridian passage of heavenly bodies.

Nautical Almanac.—Full explanation, and use of pages i–xviii, and the two Tables of places of fixed stars, viz.: "Mean Places for January" and "Apparent Places at Upper Transit at Greenwich." To take out a planet's right ascension and declination.

Corrections for Altitude.—Investigation and construction of tables for—

1. Dip.
2. Refraction.
3. Parallax.
4. Semidiameter.

To prove the rules and work examples in the following problems :—

1. To find the latitude by meridian altitude of star, planet, or moon.
2. To find the latitude by Polaris.
3. To find latitude by ex-meridian altitude of sun, star, moon, or planet.
4. To find latitude by double altitude of sun, star, planet, or moon, or combination of them.
5. To find the longitude by star or moon chronometer.
6. To find the error of chronometer by a single altitude of a star, and to find the rate of the chronometer.
7. To rate chronometer by equal altitudes.
8. To find variation of compass by Time-azimuth.

Lunar Distances.—To explain generally the method of finding the longitude by lunar distances, and to work examples.

To describe and work examples in Sumner's method of determining the position of a ship.

Tide Tables.—Explanation and use of "Establishment of Port."

Honours.

In addition to the above, will be required—

To work problems on time.

Full knowledge of the Nautical Almanac. Complete explanation and calculations of nautical tables for corrections, &c.

Estimation of the most advantageous times and circumstances for different observations and degree of dependence.

"Equation of Equal Altitudes."

Investigation of the problem of longitude by lunar distance, and different methods of clearing the distance.

Theoretical and practical knowledge of all the methods of determining the latitude, longitude, and variation of the compass.

Miscellaneous problems, such as time of rising and setting of heavenly bodies, twilight, &c., &c.

Tides.

Surveying.—Problems requiring a knowledge of nautical astronomy.

The Examination will consist of a preliminary written paper, and those who qualify therein may be required to attend a practical examination at South Kensington at a subsequent date.

SUBJECT XXII.—STEAM.

First Stage or Elementary Course.

Students in this course will be required to possess some knowledge of the effects of heat on matter, such as changes of temperature, expansion, change of elasticity, vaporization, liquefaction; they must also know something of the phenomena of the radiation, absorption, conduction, and convection of heat; they will be liable to questions relating to the mechanical equivalent of heat, as well as to the conversion of work into heat and of heat into work; they must also inform themselves on the following subjects, viz., the causes which influence the boiling temperature of water, the boiling points of fresh and salt water, high-pressure steam, measure of steam pressure by atmospheres, the relation between the pressure, density, and temperature of steam, the specific volume of steam, the latent heat of steam, the quantity of water required to produce condensation, the distinction between saturated and superheated steam.

EARLY ENGINES.—Newcomen's atmospheric engine, its defects. The discoveries of Watt. Hornblower's compound engine.

THE SINGLE-ACTING CONDENSING PUMPING ENGINE.—Details connected with this engine; the steam cylinder, the steam, equilibrium, and eduction valves, their action; the steam-jacket, the clothing of the cylinder; the condenser, the air-pump, the foot-valve, the delivery valve, the snifting valve, the hot well; the piston rod, stuffing boxes and glands; the construction of the beam in large engines, the plug rod, the parallel motion; the method of starting the engine, and of regulating its speed, the construction and action of the cataract.

DOUBLE-ACTING CONDENSING ENGINE.—Details of the various parts, the cylinder, how constructed, the ports or openings into the cylinder; the various forms of valves in common use, the methods of balancing valves, the three-ported valve, the lap on a valve, the lead of a valve, the eccentric; details of the piston, metallic packing rings; the air-pump, jet condenser, the surface condenser, gauges for the condenser, the barometer gauge, method of estimating pressure by it, errors in this method, and correction of the same; the crank and connecting rod, the strap, gib, and cotter, the beam, parallel motion in beam engines, the governor, the flywheel; stopping and starting gear. Various types of direct-acting condensing engines.

THE NON-CONDENSING ENGINE.—Various types of direct-acting engines.

THE EXPANSION OF STEAM.—Saturated and superheated steam; law of expansion; the object of expanding steam; modes of carrying out expansive working. Expansion valves; double beat valve, crown valve, gridiron valve; wire drawing of steam, the throttle valve.

STATIONARY BOILERS.—The Cornish boiler, the Lancashire boiler, the vertical boiler; heating and fire-grate surfaces, the evaporative power of boilers, boiler chimneys; the strength of boilers, the use of stays, the proving of boilers. Boiler appendages; safety valves, reverse or atmospheric valves, communication or stop valves; the glass water gauge, steam pressure gauge, various forms, the heating of feed water, feed pumps. Priming, its causes and remedies.

THE MARINE STEAM ENGINE.—Various types of paddle-wheel engines; the oscillating and inclined engine, various types of screw propeller engines. Details of parts connected with the working of marine engines, expansion and reversing gear; bilge and feed pumps.

MARINE BOILERS.—General forms and construction; tubes and flues; the funnel and its casing; fire-bridge and ashpit, waste steam pipe, water gauge, gauge cocks, pressure gauges, safety valves, reverse valves, stop valves, feed pumps, boiler hand-pumps; feed or donkey-engine; Kingston's valves, blow-out cocks, brine-pumps and brine-valves; the methods of ascertaining the degree of saltness of the water in a boiler, amount of saltness permissible; formation of scale; superheating apparatus; surface condensation.

THE LOCOMOTIVE ENGINE.—The general construction of a locomotive engine and boiler before the invention of Stephenson; description of the Rocket engine as the type of the modern locomotive, the tubular boiler, the draught produced by the discharge of waste steam.

DETAILS.—Inside cylinders, outside cylinders, steamways, ports, slide valve; water cocks, grease cocks, the piston and packing-rings, piston-rod, guides, connecting rod, eccentrics, the reversing or link motion, reversing lever, sector, expansive working; crank axle and driving wheels, power required for traction, adhesion of the driving wheels, counter weights to cranks, wheels and axles, axle-boxes, bearing springs, buffer and draw springs, friction brakes.

THE BOILER.—The fire-box, the inner and outer shell, the cylindrical barrel, the tubes, mode of fixing them, fire-box stays, gusset stays; the ash-pit, the smoke box, the blast pipe, mechanical action of the blast; the steam chest, the outer dome, the steam pipe, the regulator, safety valves, pressure gauges; whistles, blow-off cocks, feed pumps, Giffard's injector; evaporative power of the boiler, fire-grate and heating surface, combustion of fuel; the

tender, water-tank, tank-engines, brake, feed pipes; coke burning engines, methods of consuming smoke in coal-burning engines. Ramsbottom's method of filling the tender.

In this examination it is essential that the student should acquire the power of making hand sketches of the various parts which he may be called upon to describe. The observations made in the syllabus for Applied Mechanics hold equally in this subject, and it is further to be noted that the student is liable to be questioned as to the mechanical principles involved in any of the matters herein mentioned.

Second Stage or Advanced Course.

Students will be examined in the subjects already set forth, but will be expected to show a more extended knowledge of the same, and they should now be prepared also to answer questions in accordance with the second part of the syllabus as follows:—

Valves and Valve Gears.—Various types of valves, the double and treble ported, the piston, the Trick, and other valves. Meyer's expansion valve. The position of eccentrics on the crank-shaft; Zeuner's valve diagrams; effect of length of rod in modifying steam distribution. The valve motions or gears of Stephenson, Hackworth, Marshall, Corliss, Joy, and others. Expansion valves for compound engines. The distribution of steam in various types of compound engines.

Condensation.—Surface and jet condensers. Extent of surface required in surface condensers. Amount of water necessary for the condensation of steam. Construction of air pumps and circulation pumps. Ejector condensers.

Compound Engines.—Various types of compound engines, triple and quadruple expansion engines. Webb's compound locomotive engine.

Fly wheel and Governors.—Theory of their action. Proper diameter and weight for fly-wheels, details of construction of the fly-wheel. Construction and action of Watt's pendulum governor, of the Porter governor, and of other high speed governors. The parabolic governor.

The Indicator.—Description of the instrument, the atmospheric line. Method of taking a diagram. The general configuration of diagram to be expected under various circumstances. Examination of the indicator diagram when the steam is throttled; when expansive gear alone used, and in other cases. To ascertain the horse-power of an engine by means of the indicator. The indicator-diagram in engines of various types. The combining of the indicator cards of a compound engine.

Propellers.—Paddle wheels, feathering of the floats, disconnection and immersion of wheels. The screw propeller, various forms, length, angle, pitch, and area of screw blade, disconnecting and raising the screw; the position of the screw propeller in the vessel, twin screws, the slip of the screw; the method of receiving the thrust upon the vessel, soft metal and hard wood bearings.

Theoretical Portion.—Work done during the conversion of water into steam; work done in a steam cylinder when the steam is expanded; work done in the air-pump; work developed by a crank; inertia of reciprocating parts, diagram of crank pin effort. Method of measuring the efficiency of a steam engine; meaning of absolute temperature; isothermal and adiabatic curves; efficiency of heat engines; experimental testing of engines; estimation of loss of fuel by "blowing out"; calculations relating to parallel motions, such as Watt's and Peaucellier's; estimation of the relative positions of the piston and crank in any part of the stroke; diagram showing the relative motions of the slide and piston; dynamometer, its use in finding the horse-power of an engine.

In order to encourage the study of the gas engine some questions will be set in the advanced course, which will embrace the following subject-matter; but these questions will not be compulsory.

Hot-air and Gas Engines.—General principles underlying the action of such engines. Stirling's hot-air engine; the regenerator; the construction of refrigerating machines. The efficiency of air engines. Explosive mixtures of gas and air. The Lenoir engine. The Otto engine. Details of construction of the Otto engine. The valves required, their construction and action. The charging of the cylinder. The firing of the charge. Mechanism for operating the valves, for regulating the speed, and for admitting the gas. Fittings of the engine. The cycle of operations. The indicator diagram. The efficiency of the engine.

Honours.

The range of subjects will comprise the whole syllabus, and students will be expected to show a more extended knowledge, both in a theoretical and practical direction, than is required of them in the second stage.

SUBJECT XXIII.—PHYSIOGRAPHY.

Note.—Demonstrations and Practical Work in Astronomical Physics at the Royal College of Science, London (price 6*d.*), may be obtained. [*See* list of publications at end of the Directory, or Form 1123.]

Elementary Stage.

Matter.—Forms of matter. Indestructibility of matter. Mass, volume, density, specific gravity, and weight. Centre of gravity.

Force, Motion, and Inertia.—The parallelogram of forces. Composition and resolution of forces. Conversion of rectilinear into circular motion.

The Mechanical Powers.—Principles of the lever, the pulley, the inclined plane, and the screw.

Energy.—Heat, radiation, electricity, and chemical action as forms of energy. Mechanical Work.

Heat and Temperature.—Discrimination between heat and temperature. Effects of heat. The measurement of temperature by thermometers. Change of state caused by heat, as in ice, water, and steam.

Radiation.—Rectilinear propagation of radiation. Reflection and refraction of radiation. The analysis of light by a prism, and its recomposition. The colour disc. The visible spectrum.

Chemical Composition of Matter.—Mixtures and compounds. Water, its composition proved by analysis and synthesis, its physical properties. Elementary properties of oxygen, nitrogen, hydrogen, carbon, iron, and mercury; and of water, carbon-dioxide, lime, silica, and the alkalies common salt, iron oxide, and mercuric oxide.

The Earth, the Sun, and the Moon.—Form, density and dimensions of the earth. Rotation of the earth on its axis. Latitude and longitude. Density and dimensions of the Sun. Distance of the Earth from the Sun. Inclination of the Earth's axis. The general features of the Earth's orbit. Kepler's laws, and Newton's explanation of them. Cause of variation in length of day and night. The four seasons. Distance and dimensions of the Moon; lunar and solar eclipses.

Measurement of Space, Mass, and Time.—Units of space and mass are empyrical. Measurement of angles. Subdivision of the day into hours, minutes, and seconds. The Sundial. Greenwich and local times.

The Atmosphere.—Weight of the air, pressure on the earth's surface, height of the atmosphere. Boyle's law. The principle of the Mercurial Barometer. Pressure of the atmosphere at different altitudes. Composition of the atmosphere and the diffusion of gases; animal and vegetable life in

relation to the atmosphere. Isobars. The manner in which the atmosphere is warmed and its temperature at different elevations. Isotherms. Fog mist, clouds, rain, snow, hail, dew, and hoar-frost. Winds and their causes. Circulation of the atmosphere. Land and sea breezes; monsoons and hurricanes; trade winds and their causes. Rain fall; method of measurement.

The Sea and Circulation of Water on the Land.—Composition of sea water. Its specific gravity and freezing point. Proportion of land to water. Division into oceans and seas. Sea level. Depths of oceans. Circulation of water. Currents in the oceans. Effect of temperature on seas. Springs and rivers.

Rivers and Glaciers.—Tidal rivers and deltas. Glaciers and formation of moraines. Icebergs.

The Earth's solid Crust and the Changes which take place in it.—General classification of rocks into aqueous, igneous, and metamorphic. Their characteristics and common examples of each. Their chemical components and modes of occurrence. Earthquakes, volcanic phenomena, action of the atmosphere and water. Constructive and destructive action of organisms such as result in the formation of limestone, coral-reefs, and coal. Specific gravity and hardness of rocks. Density of the earth as a whole.

Terrestrial Magnetism.—Properties of the lodestone and artificial magnets. The earth a magnet. Primary laws of magnetic attraction and repulsion. Dip. The earth's magnetic poles.

Advanced Stage.

Matter.—Rigidity, elasticity, compression, and torsion.

Wave Motion.—Nature of waves in water, sound waves in air, and radiation waves in ether. Molecular vibration. Absorption of wave motion. Velocity of sound waves and of waves in ether.

Energy and Work.—Conservation, transmutation, and degradation of energy. Simple laws of the pendulum.

Heat and Temperature.—Registering thermometers, pyrometers. Capacity for heat and specific heat. The mechanical equivalent of heat. Experimental determinations of the mechanical equivalent of heat.

The Atmosphere.—Atmospheric refraction. Absorption of radiant energy by the atmosphere. Action of dust and fine particles.

Atmospheric Phenomena.—Climate and rainfall. The formation of dew. Determination of the dew point. Cyclonic and anticyclonic movements of the atmosphere. Weather charts. Isobars.

Radiation.—The infra-red and ultra-violet portions of the spectrum. The thermal, illuminating, and chemical effects of the spectrum. Absorption of dark radiation by water vapour and its effects. Causes of the colour of the sky and sunset effects. Lightning and the Aurora.

Seas and Lakes.—Tides, in the ocean and in inland seas, their cause. Courses of tidal waves round the British Islands; spring tides, neap tides. Effect of winds on the sea. Heights and breadths of waves. Modes of determining depths of the sea. Abysmal deposits. Temperature of the oceans at surface and different depths; effects of pressure in the ocean. Classification and modes of origin of lakes.

The Earth's Crust.—The chief varieties of rocks of which it is made up. Chemical composition, crystalline forms and physical properties of the most common rock-forming minerals. Distribution of temperature in the Earth's crust. Methods of determining temperatures in mines, boreholes, etc. Geysers and mineral springs. The formation of mineral veins. The distribution and causes of volcanic and earthquake phenomena. Seismometry, and the study of earthquake waves. The great movements that take place within the earth's crust. Folding, faulting, and the production of mountain-struc-

tures. Action of rain, rivers, glaciers, and the sea in earth-sculpture. Deposition of sediments and the formation of stratified rocks.

The Universe.—Methods of determining the rotation and revolution, precession and nutation of the earth; and its distance from the sun. Sun-spots and faculæ and the sun's rotation. The planets and their moons, periods of revolution round the sun. The law of gravity in the solar system. Discovery of Neptune. Comets, their nature and orbits. Stars, their classification into magnitudes. Proper motions of stars. Photographic star charts. Variable stars. Double stars. Nebulæ.

Terrestrial Magnetism.—The horizontal and vertical components of the earth's magnetism. Position of terrestrial poles. Variation of the needle. Diurnal and other variations. Connection between Aurora and magnetic storms.

Honours.

Candidates for Honours will be required to show a fuller and more exact knowledge of the subjects comprised in the Advanced Syllabus, and in addition to answer questions concerning—

The density and probable composition of the earth's interior. Meteorites: their chemical composition, mineralogical constitution, minute structure, and their resemblances to, and differences from the rocks of the earth's crust. The classification of meteorites, the characters of their surfaces, the circumstances attending their fall, and their relation to "shooting-stars" must also be understood.

Principles of spectrum analysis. Selective absorption. Reversal of spectral lines. Kirchoff's experiment. Stokes' law. Fraunhofer's lines Solar and stellar spectra. Classification of stars according to their spectra.

Sources of solar energy and the state of our present knowledge of the various phenomena occurring on the sun's surface.

The sun spot cycle and its assumed connection with terrestria phenomena. The nebulæ and meteoric hypotheses.

SUBJECT XXIV.—THE PRINCIPLES OF AGRICULTURE.

First Stage or Elementary Course.

The object in this stage is to lay a ground-work of elementary facts and principlee; unless these are clearly understood there can be no accurate knowledge of the subject.

The paragraphs in brackets are designed for the use of the teacher, and enumerate the subjects he is expected to treat of. The teacher should illustrate his lessons, as far as possible, by exhibiting the objects spoken of, or by showing diagrams * or drawings, or by performing experiments. Some suggestions regarding experiments will be found at the end of this section. Examples should be chosen, by preference, from local objects and practices, as these will possess the greatest interest for the class.

It is very desirable, if not absolutely essential, that in order to obtain any real knowledge or grasp of the principles of Agriculture, a course of Elementary Chemistry, such as the alternative First Stage in Subject X., should precede any attempt to teach them, and it is very probable that stringent measures insisting upon this will be taken before long. Where this previous instruction has not been given, the teacher has many explanations to give which must greatly interfere with the thread of his teaching.

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* A few diagrams have been specially prepared for this course, and may be obtained from Messrs. Chapman and Hall.

1. Plant Composition.—Proportion of water, combustible matter, and ash; chemical elements in each. The essential constituents of plants. Distribution of ash constituents in the plant. General composition of farm crops.

[First object of agriculture the production of crops, the second the breeding and feeding of animals. Composition of plants, proportion of water and solid matter. Division of solid matter into combustible and incombustible. Percentage of ash yielded by corn, straw, hay, roots, &c. Chemical elements contained in the combustible constituents. Chemical elements in the ash of plants. Ash constituents which are essential for all plants. Non-essential, yet often useful ash constituents. Distinction between essential and non-essential ash constituents, how ascertained. Characteristic differences between the composition of the ash of grain, and that of straw or leaf. Quantities of dry matter, nitrogen, and principal ash constituents, in ordinary crops of wheat, beans, meadow hay, clover, turnips, mangel, and potatoes, in pounds per acre. Classification of crops according to composition. Possible replacement of one ash constituent by another when crops are grown on different soils.]

2. Plant Life.—Chemical elements obtained from the air. Action of light on chlorophyll cells; formation of organic matter. Chemical elements obtained from the soil. Action of the roots. Life history of annuals, biennials, and perennials. Formation of seed. Germination.

[Chemical elements obtained by the plant from air. Composition of the atmosphere. Substances in air serving as plant food. Assimilation of carbon, hydrogen, and oxygen. Function of the chlorophyll cell. Action of light and heat. Distinction between the nutrition of green plants and of those destitute of chlorophyll. Formation of organic matter. Plant respiration. Chemical elements obtained from soil. Plant transpiration, amount of water evaporated by crops. Influence of depth and distribution of roots; differences in this respect in various crops. Assimilation of plant food from the soil. Rain water, its action in the soil. Composition of the solution in a soil. Assimilation of nitrogen; nitrogenous substances in soil acting as plant food. Special nutrition of Papilionaceæ, how proved. Solvent action of root hairs on inorganic materials in the soil; substances specially assimilated in this way. Destination of the ash constituents in the plant. General differences in the life history of annuals, biennials, and perennials. The storing up of plant food for a second season. The exhaustion of the plant during the formation of seed. General structure and composition of seeds. Germination; conditions essential for. Points to be remembered in sowing seeds on a farm. Chemical changes during germination, conversion of reserve matter into soluble nourishment.]

3. Soil Physics.—Conditions of a mass of small particles. Properties of sand, clay, humus, and calcareous matter. Heavy and light soils. Capacity for water of soils. Capillary action. Evaporation. Treatment of wet and dry soils. Sources of heat. Circumstances which influence the temperature of soil and sub-soil.

[Soil considered as a mass of small particles of various sizes. Circumstances which determine the total surface of the particles, and the proportion of the space between them. Influence of porosity of the particles. Hardness, specific gravity, and physical characters of quartz-sand, limestones, clay, and humus. Difference in adhesiveness of coarse and very fine sand. Clay, a mixture of extremely fine sand and a small quantity of a colloid body; evidence for this. Coagulation of clay by lime. Differences in physical characters of soil according as clay is coagulated or uncoagulated. Action of dressings of lime or chalk on heavy land. Humus, its origin; roughly divided into humin and humates. All humates colloid bodies. The principal cementing materials in soil, clay and humates; their action separately and together. So-called "heavy" and "light" soils. Their physical characters, how improved. Effect of the treading of sheep. Explanation of terms such as "loam," "clay," "marl," "peat."

Circumstances which determine the capacity for water of soils when saturated. Adhesion of water to surfaces; capillary attraction. Capacity for water of soils when drained. Evaporation from soils when saturated; in-

fluence of time of year. Evaporation from soils when drained. Circumstances in which water is brought to the surface by capillary attraction. Influence on evaporation of looseness of texture, of stones, of surface-cultivation and mulching, of crops and weeds. Practical applications of these facts; effect of ploughing, summer cultivation, hoeing, rolling. Wet and dry soils. Influence of subsoil on soil moisture. Water level in subsoil. Treatment of wet and dry soils. Influence of draining, and of farmyard manure.

Heat from chemical action, example of hot-bed and damp hayrick. Amount of heat from this cause. Heat from the sun. Influence of atmosphere. Great influence of angle of incidence of sun's rays; aspect of fields. Mean temperature of soil, its variation with climate. Maximum and minimum temperature of surface soil compared with that of the air. Influence of colour on amount of heat absorbed. Night radiation. Specific heat of water, humus, clay, limestone, and quartz-sand, reckoned both on weight and volume; its influence on soil temperature. Conduction of heat by soil constituents; influence of fine or coarse division, loose or firm texture, dryness and wetness. Preponderating influence of water on soil temperature. Loss of heat by evaporation. Warm and cold soils. Effect of draining on temperature. Temperature of the subsoil at various depths.]

4. Soil Chemistry.—Origin and chemical nature of sand, clay, calcareous matter and humus. Effect of weathering, of vegetable and animal life, and of tillage. Retentive power of soil for plant food. Oxidation in soils under various conditions. Circumstances determining the accumulation or diminution of nitrogenous organic matter in the soil. Composition of soil per cent. and per acre. Active and inactive condition of elements of plant food.

[Describe the history and formation of some soil in the neighbourhood. Describe sand, its origin and constituents; clay, its origin and constituents; calcareous matter, its origin and constituents; humus, its origin and composition. Point out the general distribution of plant food among the ingredients of soil. Effect of "weathering" on the inorganic constituents of soil; disintegrating action of frost solvent action of water containing carbonic and humic acids. Effect of autumn tillage and bare fallow. Effect of vegetation accumulating humus at the surface. Action of animal life, worms, moles, ants, &c. in the soil. Differences between surface soil and subsoil.

The absorptive or retentive power of soils towards ammonia, potash, magnesia, lime, and phosphoric acid. Substances for which soil has little or no retentive power. The absorptive action of humus, hydrous silicates, and hydrated ferric oxide. Influence of lime in assisting the absorption of bases from salts. Difference in the retentive power of various soils; importance of this fact as regulating the choice and time of application of manures.

Oxidation of organic matter in soils, action of animal life, fungi, and bacteria. Final products of oxidation. Origin of saltpetre and nitrate of soda. The nitrifying bacteria; in what part of the soil most abundant. The effect on their action of varying conditions of temperature, supply of water and oxygen, and of basic matter. Effect of tillage on production of nitrates. Accumulation of nitrates during bare fallow. Influence of manure on the production of nitrates. Solubility of nitrates, their removal into the subsoil and into drainage and well-water. Action of crops in taking up the nitrates in the soil, and in diminishing drainage. Conditions favourable to the diminution of the nitrogenous organic matter of the soil. Conditions favourable to the accumulation of nitrogenous organic matter. The root and stubble residue left by various crops. Special effect of laying down land in pasture, and of the cultivation of deeply rooted leguminous crops. Effect of farmyard and other organic manures.

Show chemical analysis of a soil, if possible one in the district. Mention quantities per cent. of nitrogen, phosphoric acid, potash, lime, and magnesia, found in common soils, fertile and infertile; show their amount in pounds per acre to a depth of nine inches. These constituents mostly insoluble; practical importance of this fact. Nature of soluble matter shown by composition of drainage waters. Action of plant roots upon insoluble inorganic plant food depends on its condition. Illustrate from published experiments

that abundance of nitrogenous matter, phosphates, and potash may exist in a soil, and yet the crop starve for lack of them. Distinction between active and inactive plant food. The great value of manures supplying food immediately available to the crop; the fertility thus imparted soon exhausted. Distinction between the permanent fertility of a soil and the condition superinduced by high farming.]

5. TILLAGE.—Implements, and effect of tillage.

[Describe the ordinary plough, cultivator, harrow, and roller, and point out the special action of each. The importance of tilth. Recapitulate the effect of tillage operations on the water, heat, weathering and oxidation of the soil, and show how the special mode of tillage can be altered to meet varying requirements.]

6. MANURES.—Object of manuring. Liming, its effect. Constituents of farmyard manure, circumstances which determine its value. Different kind of litter. Box and yard feeding. Fermentation of dung. Its characters as a manure. Bones; soils and crops most benefited by them. Superphosphate; its manufacture, its special advantages. Use of nitrate of soda and kainite.

[Object of manuring the increase or maintenance of the fertility of land. Removal of plant food from land by drainage, crops, and animal produce; return of plant food in manure.

Application of chalk, marl, or lime, an ancient practice. In chalk and marl lime is combined with carbonic acid, as in soil. Continual waste of lime from surface soil. Recapitulate physical and chemical effects of carbonate of calcium in soil. It also aids decomposition of silicates, neutralises humic acid, promotes oxidation of vegetable matter. Lime, how prepared from limestone; its behaviour with water (hence "quick" or endowed with life); the chemistry of these processes. Chemical effects of lime at first far more energetic than those of chalk. The conversion of lime into carbonate in the soil. Lime from dolomite (if this is a local rock), the difference in its composition and action. Give detailed composition of marls, if these are used locally. Soils and crops specially benefited by liming. Quantities of chalk and lime applied. Precautions necessary when quicklime is employed.

Farmyard manure composed of liquid and solid excrements plus litter. Solid excrements are undigested matter; liquid, contain the nitrogenous waste products of the body, principally urea. Distribution of ash constituents between them. Comparative value of liquid and solid portion. Richness of manure dependent on character and amount of food, and on the use made of food by the animal. The manure of different animals, characteristic differences as to proportion of water. Different kinds of litter, their composition and absorptive power. Quantity of litter required for a horse, cow, and fattening ox, and quantity of fresh manure yielded. Fermentation of urea. Losses of ammonia in stable from various animals; how best diminished. Box feeding, its advantages. Feeding in open or covered yards, its advantages and disadvantages. Losses by drainage. Liquid manure, its composition; how dealt with. Formation of manure heap. Fermentation of dung, its results. Losses in the manure heap, how prevented. Advantages of applying fresh manure to the land. Composition per cent. and per ton of farmyard manure. Its character as a general manure. Its influence upon the physical properties of soils. Quantity available for use on a farm; how best employed. Slow action of the plant food it contains. Advantages of feeding animals upon the land.

Bones, fresh, steamed, and boiled, their composition. Forms in which employed. Soils and crops most benefited by their use. Quantities applied. Slowness of action.

Superphosphate, the object of its manufacture. Chief materials used. Chemistry of the process. Meaning of the terms tricalcic, dicalcic, and monocalcic phosphate, also of the commercial "soluble," "reverted," and "insoluble" phosphate. Composition of superphosphate. Its action as manure compared with bone. Soils and crops most suitable for its use. Quantities applied. The combinations formed by phosphoric acid in the soil.

Nitrate of soda, whence obtained. Its composition. Nitrates a natural plant food. Soluble, not retained by the soil. Precautions necessary to

employ nitrate of soda advantageously. Crops most benefited by its use. Quantities employed.

Kainite, its composition, its origin. Freely soluble, but potash and magnesia retained by a good soil. Soils and crops most benefited by it. Quantities applied.]

7. Crops.—Composition in pounds per acre of average farm crops. Exhaustion of land by sale of crops. Special characteristics of different crops; influence of these on their selection and manuring.

[Show amounts of dry matter, nitrogen, phosphoric acid, potash, lime, and silica, in average crops of wheat, barley, oats, meadow hay, red-clover hay, beans, turnips, mangel and potatoes, and any other crops common to the district, in pounds per acre. Classify as rich or poor in nitrogen, in potash, in silica. Regard separately the part of the crop removed from the field, or sold off the farm, pointing out what procedure exhausts the land most in important ash constituents. Show, if possible, what is the loss to the land by sale of products in any simple rotation usual in the district.

Point out the suitability of different crops for the various climates in Great Britain, and any marked preference of particular crops for a special kind of soil. Show the differences in the root development of crops, their length of period of growth, the feeding power of their roots. What is easy for one crop to obtain is difficult for another. Compare wheat and beans as to their capacity for obtaining nitrogen and silica, and turnips and mangel as to their capacity for obtaining phosphates from the soil. The selection of manures is generally based on the special needs of the crop, and not on its composition; a general manure frequently not required. Show from published experiments the effect of nitrate of soda on cereal crops and mangel, and the effect of superphosphate on barley and turnips. Some crops, as potatoes and pasture, usually require a general manure.]

Suggested Experiments.

1. Ash of Plants.—Twist a piece of stout platinum or iron wire many times round two or three inches of a small branch, and burn over a Bunsen or spirit flame upon a plate. Note the residue of incombustible matter, or ash; observe that the bark yields the most ash.

2. Carbonic Acid in Air.—Expose clear baryta or lime water to air in a beaker at the beginning of the lesson. Observe the film formed on the surface, composed of barium or calcium carbonate.

3. Production of Starch in Sunlight.—Gather a few leaves (the leaves of seedling cabbage plants answer the purpose excellently), and keep them for some hours in a warm moist atmosphere in the dark. Gather leaves from same plant after some hours' exposure to sunshine. Examine both leaves for starch by dipping them successively into boiling water, into methylated spirit till white, into cold water, and finally into a weak solution of iodine in potassium iodide.

4. Starch Stored up in Autumn.—Take a thin section of large bough of beech, ash, oak, or elm, felled in winter, and treat successively with boiling water and with iodine solution. Observe where starch has been deposited.

5. Reserve Matter made Soluble by Germination.—Show that ground pale malt is soluble to a large extent in warm water (temperature 130° Fahr.), and yields a sweet solution, while barley meal is practically insoluble.

6. Coagulation of Clay by Lime.—Mix clay soil with rain water. After subsidence fill two beakers with the turbid liquid; to one beaker add a few drops of a strong solution of calcium chloride, and stir. Note the rapid precipitation of the clay.

7. Humates in Soil.—Place some powdered garden soil on a filter, and pour upon it a weak solution of ammonium carbonate. The insoluble humates will be decomposed, and pass into the filtrate as ammonium humate; the humin will remain on the filter unchanged. On adding an excess of calcium chloride to the filtrate the humic acid is precipitated as calcium humate, along with

calcium carbonate. It is better to use ammonia in place of the carbonate, if the soil will yield a dark coloured solution when so treated, as in this case the calcium humate can be precipitated without the carbonate.

8. Diffusible and Nondiffusible Bodies.—*Fold two pieces of parchment-paper in the form of filters, of such a size that they may be supported in the mouth of a pint beaker. Fill the beakers with water, so that about half the filter is standing in water. Pour into one filter a solution of potassium permanganate, or potassium bichromate; the coloured salt at once diffuses through the membrane into the beaker. Pour into the other filter a solution of burnt sugar; the coloured substance is in this case a colloid body, and (if the membrane is free from holes) will not diffuse into the surrounding water.*

9. Capillary Action.—Show the rise of a coloured liquid, as ink and water, in white blotting paper.

10. Specific Heat.—Take two cylinders of iron and tin, of the same shape and weight. To prepare these, cut off 1¼ inch of rod iron, ¾ inch in diameter, make a mould from it in plaster; take the same weight of tin as iron, melt it and pour it into the mould. Attach wire or string to the cylinders so that they can be suspended. Immerse both in boiling water. Take them out simultaneously, and place them on a cake of wax supported by its edges. The wax should be of such thickness that the hot iron perforates it and falls through, while the tin remains supported.

11. Cooling by Evaporation.—Place a few drops of water on a block of wood, and then stand a small beaker on it. Place a little ether in the beaker and blow over it with a pair of bellows. The evaporation of the ether will freeze the water.

12. Washing out Nitrates from Soil.—Place some powdered garden soil on a filter, and pour upon it a little water. To the filtrate add a few drops of a solution of diphenylamine in sulphuric acid, and then very gradually and cautiously some oil of vitriol; a dark blue colour will show that nitrates are present in the solution.

13. Slaking Lime.—*Place a few lumps of freshly burnt lime on a plate, and sprinkle them with water. Observe the production of heat, and the falling to powder of the lime, which attend the change into calcium hydrate.*

14. Ammonia produced from Urea.—*Show that urea is colourless. Boil urea in a flask with a dilute solution of caustic potash or soda; show the production of ammonia by its odour, and by holding turmeric paper in the vapour.*

15. Soluble and Insoluble Phosphates.—*Mix a little bone dust with water in one beaker, and a little superphosphate with water in another; filter. Add a few drops of solution of ferric chloride to each liquid, followed if necessary by sodium acetate. The precipitation of ferric phosphate indicates the presence of a soluble phosphate.*

Second Stage or Advanced Course.

The subjects on which students will be examined in this stage comprise all those enumerated in the first stage, with the following in addition:—

8. Atmosphere.—Detailed composition. Rain and dew, their composition Condensation of water on plants and soils.

9. Soils.—Mechanical analysis of soil. Clay-burning, its uses. Hygroscopicity. Absorption of ammonia, and of nitrogen (?) from the air. Movements of salts in soil. Formation of "pan" in soils. General principles of draining. Special advantages of steam tillage. Causes of infertility.

10. Manures.—Green crop manuring. Feeding sheep or cattle on the land. Comparative manurial value of ordinary foods. Liquid manure. Seaweed. Guano. Fish manure. Sulphate of ammonia; its comparison with nitrate of soda. Soot. Wool refuse. Basic slag. Gypsum. Common salt. Price per unit of manure constituents; how reckoned. Mode and time of

application of manures, and quantities employed. Conditions of soil and climate which should influence the selection of manures. Return in crop for manure applied. Composition of drainage waters from manured land.

11. Seeds.—Per-centage fertile, how determined. Circumstances affecting the germinating power of seed, and the vigour of the plant produced. Change of seed. Impurities and adulterations. Quantities of seed per acre.

12. Crops.—Botanical position of common British crops. New varieties; how produced. Composition in different stages of growth. Chemical changes in the ripening of grain, root, and fodder crops. Influence of season and climate on the amount and quality of produce. Production of malting barley. Influence of the special tillage and period of growth of various crops upon the utilisation or waste of soil nitrogen. Cereals, why commonly called exhaustive. So-called restorative crops. Rotations, why adopted. Examples or rotations to suit varying conditions. The use of catch crops. The statistics of the farm: soil constituents sold as vegetable and animal produce, and returned as purchased food and manure.

13. Meadow and Pasture.—Laying down land to grass; the seeding and subsequent treatment most suitable for temporary or permanent grass land. Accumulation of nitrogen in the soil under these conditions. Names and characters of the commonest grasses, leguminous plants, and weeds in meadow and pasture. Species adapted to various soils and climates, and for early or late growth. Effect on the botanical character of the herbage of mowing or pasturing, and treatment with various manures. Chemical composition of produce. Appropriate manuring of hay meadows and pastures.

14. Hay-making and Ensilage.—Gramineous and leguminous hay-crops, best time for cutting. Difference in composition between hay and green herbage. Crops used for ensilage. Process for making sweet or sour silage. Chemical changes during hay-making and ensilage. Relative advantages of these methods.

15. Diseases of Plants.—Mode of growth and nutrition of fungi. Rust, smut, bunt, ergot, potato disease, club root, and other diseases. Preventive and remedial methods. Insect pests. Preventive and remedial methods.

16. Poultry Management.—*Origin of our various kinds of poultry. Productions of eggs, and variations in productive power. Management of poultry whilst sitting. Artificial incubation. Turkey mothers. Growth and preparation of poultry for the table and for market. Description of the pure and cross breeds, and their relative advantages. Methods of fattening.*

17. Live Stock.—Principal breeds of agricultural horses, cattle, sheep, and pigs in the United Kingdom; their distinguishing characters, and suitability for various purposes. The principles of breeding; natural variation, heredity, prepotency, reversion.

18. Animal Composition.—Rothamsted per-centage analyses of whole bodies of animals. Chemical elements in animals. Chief combustible constituents classified as (1) Nitrogenous—albuminoids, gelatinoids, keratin; and (2) Non-nitrogenous—fats. General per-centage of nitrogen in nitrogenous constituents. Composition of fats. Characteristic ash constituents of blood, muscle, and bone. Differences between the composition of different animals; alterations from youth to full age, and during fattening.

19. Animal Nutrition.—Essential differences between the nutrition of plants and animals; production of heat and work by animals. The principal constituents of cattle foods. Function of the albuminoids of food; production of nitrogenous tissues; production of urea; production of fat. Functions of amides, fats, carbohydrates, and ash constituents. Relative value (as producers of heat, work, and fat) of albuminoids, amides, fats, and various carbohydrates.

Processes of digestion and assimilation. Action of enzymes as hydrolysers. Special solvent action of saliva, gastric juice, and pancreatic juice. Difference between ruminants and non-ruminants. Action of bile. Digestion of cellulose. Absorption of dissolved food. Undigested matter. Functions of the blood; nutrition of tissues, supply of oxygen, removal of waste products. Nature of excretions by lungs, kidneys, and skin. Function of heart and lungs. Necessity for ventilation.

20. Foods.—Average per-centage composition of foods ordinarily used on the farm. Per-centage of true albuminoids, amides, and nitrates. Vegetable fats and wax. Per-centage of starch and sugars in foods. Pectin, pentosans, celluloses, lignin. Difference in value between immature foods and grain. Influence of the age of a crop, of season, and manuring, on its composition and nutritive value. Milling and brewing products used as food. Oil-cakes; composition, impurities, and adulterations. Foods in which ash constituents are deficient.

Digestibility of foods; how ascertained. Digestion coefficients of ordinary foods in the case of cattle, sheep, pigs, and horses. Relation between the digestive power of different animals and the diets suitable for them. Influence on digestibility of quantity of ration, bruising, chaffing, pulping, and cooking food, and of labour performed by the animal. Digestibility of green herbage and of hay compared. Influence of one food upon the digestion of another. Use of salt.

Comparative value of foods for the production of heat and work, also as sources of albuminoids (albuminoid ratios). Influence of proportion of water present. Influence of flavour. Use of condiments.

21. Diets.—Water required for different animals at rest and at work. Diet for young animals. Composition of milk of farm animals. Foods nearest milk in composition. Diet for adult animals. Maintenance diets; minimum of albuminous matter required; supply of combustible matter for heat and work when at rest. Labour diet; relation between food and work, influence of pace. Diet for fattening animals. Conditions necessary for economic fattening. Composition of animal increase while fattening. Returns yielded by oxen, sheep, and pigs for food consumed. Influence of manure value of foods on their selection. Relation of food to production of wool; composition of wool. Diet for milking cows. Influence of food on the quantity and composition of milk, and upon the quality of butter.

22. Dairy.—Importance of excellence in the cow for profitable dairy work. Quantity and composition of milk from various breeds. Variations in composition during lactation. Other circumstances influencing the composition of milk. Curdling of milk by bacteria; how prevented. Fat globules in milk. Methods of separating cream by skimming, and by centifrugal machines; their respective efficiency. Composition of skim and separated milk. Composition of cream. Ripening of cream. Process of churning; results obtained with the best modern churns. Composition of buttermilk. Working and salting butter. Composition of butter. Yield of butter from milk. Rennet, how prepared; its action on milk. Cheesemaking. Acidity of milk, how ascertained. Influence of alterations in the acidity and temperature of milk, the proportion of rennet, time for curdling, &c., on the quality of the cheese. Composition of whey. Methods of ripening cheese; the changes which occur. Composition of various kinds of cheese. Details of the manufacture of Cheddar cheese. Loss to the farm by sale of milk, butter, or cheese.

Honours.

Except candidates who prior to 1896 have obtained Second Class honours, who may be re-examined, no candidate will be allowed to pass in honours after the examination of 1895 without previously obtaining a first class certificate in the Advanced Stage.

The examination for honours will not be confined to the particulars mentioned in the preceding syllabus, a fuller knowledge of the various subjects will be required. Questions may also be put on any important recent additions to agricultural science.

Candidates for honours who pass the written examination may be required to pass a subsequent examination at South Kensington (Science, sec. 10, p. 29.) There will be three supplementary examinations, and the candidate may select one of them. The subjects of the examinations will be selected from those mentioned below.

Examination A.

Practical Agricultural Chemistry.

Identification of various agricultural materials.

Qualitative examination of soils, marls, limestones, manures, drainage and potable waters, and oilcakes. Detection of adulterations.

Quantitive determinations in agricultural materials of total nitrogen, ammonia, nitric nitrogen, chlorine, sulphuric acid, phosphoric acid, lime, magnesia and potash.

Analysis of water for total solids, chlorine, ammonia, albuminoid ammonia, nitric nitrogen, and hardness.

Analysis of milk : determination of specific gravity, total solids, and fat.

Analysis of roots and fodders for sugar, starch, cellulose, and true albuminoids.

Analysis of oilcakes for moisture, oil, nitrogen and sandy matter.

A *viva voce* or written examination on methods of agricultural analysis will be added.

Examination B.

Practical Agricultural Botany and Entomology.

Description and identification of the cultivated plants of British agriculture, of their seeds, and of the adulterations of the latter.

Description and identification of the plants commonly found in the herbage of meadows and pastures.

Description and identification of the weeds of arable land, with a knowledge of their relationship to cultivated plants.

Recognition of the more common diseases of cultivated plants due to the ravages of insects and fungi, and to other causes.

Recognition of the commoner insect pests of cultivated plants.

Examination C.

Agricultural Hygiene.

General conditions of health ; sanitary buildings, ventilation.

Unwholesome and poisonous foods. Impurities of drinking water.

Animal parasites ; their life history, prevention and destruction.

Infectious diseases ; nature of the contagion, mode in which diseases are transmitted, measures used to prevent their spread.

Human diseases derived from animals ; milk epidemics.

Disinfectants, antiseptics, and deodorisers ; their nature and action.

SUBJECT XXV.—HYGIENE.

In the examination paper for the Elementary and Advanced Stages of Hygiene a certain number of questions on Elementary Human Physiology will be set, and no candidate who fails to satisfy the Examiners in this Elementary Human Physiology can pass in the Elementary Stage or in the Advanced Stage of Hygiene.

Elementary Human Physiology.

1. The form, position, and use of the bones constituting the skeleton, with a general idea as to the build of the body, as well as the boundaries and position of contents of the various body cavities.

2. The structure and arrangement of the heart, chief blood vessels, and the circulation, with a knowledge of the general composition, uses, and phenomena of blood.

3. The structure and arrangement of the lungs, with a knowledge of the theory of respiration and the changes resulting therefrom in the blood and air.

4. The general structure and uses of the teeth, stomach, and intestines, including a knowledge of the process of digestion and assimilation.

5. The position, general structure, and uses of the liver, spleen, pancreas, kidneys, and bladder.

First Stage or Elementary Course.

1. Food, Diet, and Cooking.—Classification and uses of food substances. Animal food, vegetable food, condiments; diet, requisites for maintenance; cooking, roasting, and boiling; advantageous preparation of food; cooking apparatus.

2. Water and Beverages.—Different kinds of water, sources of water, good drinking water; sources of contamination of water and its deleterious effects; cisterns and wells; tea, coffee, and cocoa—preparation and effects; fermented drinks—effects.

3. Air.—Amount of air necessary for each person; movements of air brought about by changes of density; composition of air; impurities of air; deleterious gases.

4. Removal of Waste and Impurities.—Principles of ventilation; natural ventilation; washing and soap; removal of parasites; danger of dirt. Removal of house refuse.

5. Shelter and Warming.—Materials of clothing; sufficiency of clothing for infants and adults.

6. Local Conditions.—Soil, and its drainage; aspect; elevation.—Hill, plain, and valley; distance from the sea; influence of surrounding objects; winds.

7. Personal Hygiene.—Habits; exercise, rest, and sleep, cleanliness, attention to the action of the skin and bowels.

8. Treatment of Slight Wounds and Accidents.—Treatment of cuts, burns, scalds, bleeding, fits, drowning, suffocation, poisoning, bites, and stings.

Second Stage or Advanced Course.

Including the topics enumerated under the elementary course, and in addition the following:—

1. Food and Adulterations.—Economical and wasteful diets; calculation of diets.

2. Water and Beverages.—Action of water filters; constant and intermittent systems of service; aërated waters and other beverages.

3. Examination of Air.—Chemical and Microscopical.

4. Removal of Waste and Impurities.—Artificial ventilation; closets, sinks, and baths; good and bad drains; construction and ventilation of drains; water-traps; dry and wet methods of removal of sewage; treatment and utilisation of sewage; cesspools and main sewers; sewer gas and septic organisms; disinfectants, antiseptics, deodorisers.

5. Shelter and Warming.—Injurious clothing and modes of dressing; poisonous dyes; materials used in the construction of house walls and roofs, and their properties; foundations and basement floors, damp-proof courses; floors, covering of walls, dangerous papers; fire-places, stoves, and grates; products of combustion; radiation; warming by hot air and water-pipes; introduction of warmed air.

6. Local Conditions.—Rainfalls and moisture of the air.

7. Personal Hygiene.—Influence of sex, age, temperament, idiosyncrasy; heredity. School hygiene, care of the eyesight.

8. Prevention of Disease.—Prevention of endemic diseases, *e.g.*, consumption, scrofula, rickets, rheumatic fever—marsh diseases; prevention of the spread of epidemic diseases, *e.g.*, small-pox, scarlet fever, diphtheria, measles, whooping cough, typhus and typhoid fevers, cholera; isolation and disinfection.

Honours.

No candidate can obtain Honours unless he has previously passed in the Advanced Stage of this Subject, and in the Advanced Stage of Subject XIV., Human Physiology.

In addition to the topics enumerated under the Elementary and Advanced stages, questions will be set on the following:—

Trades nuisances.
Vital statistics.
Sanitary Law.
Meteorology.

APPENDIX E.

SYLLABUS OF ART SUBJECTS.

I.—An ILLUSTRATED SYLLABUS of the Course of Instruction in Drawing in Elementary Schools may be obtained, price 2*d.*, from the Department, or 3*d.* through Agents. [*See* list of publications at end of the Directory.]

II.—SYLLABUS OF SUBJECTS IN WHICH EXAMINATIONS IN ART ARE HELD BY THE DEPARTMENT OF SCIENCE AND ART.

Freehand Drawing of Ornament in Outline.

ELEMENTARY AND ADVANCED STAGES.

(SUBJECTS 2B and 3B.)

ELEMENTARY STAGE (SUBJECT 2B).*

(1½ *hours are allowed for the Examination in this stage.*)

Candidates are required to make an outline drawing from an example of ornament in outline which is supplied to them. Their drawing of it must be on a larger scale than that of the example supplied. It should fairly fill the quarter imperial sheet of drawing paper given to the candidate at the examination.

ADVANCED STAGE (SUBJECT 3B).

(2½ *hours are allowed for the Examination in this stage.*)

Candidates are required to make an outline drawing from a Cast, on an enlarged scale, so as to fairly fill a half imperial sheet of drawing paper. A portion, about 14 inches long, of one of the Louis XII. pilasters, with or without its capital or base, or one of the scrolls of the Madeleine pilaster, or such other cast of ornament, the size of which is in fair proportion to the half imperial sheet of paper will be used at the examination and will be supplied by the Department.

No ruling, measuring, tracing, or use of instruments is allowed.

Model Drawing.

ELEMENTARY AND ADVANCED STAGES.

(SUBJECTS 3A and 5A.)

In both stages each candidate is required to draw the objects placed before him, including the drawing board on which they stand, as they appear from the point of view in which he may be seated, and his drawing is expected to show a knowledge of the effect of perspective in modifying the appearance of the models.

No ruling, measuring, or use of instruments is allowed; but the pencil may be held between the eye and the objects for the purpose of estimating their apparent relative size.

N.B.—Models and vases must be of the sizes indicated in the accompanying figures (1 and 2).

* These examinations nearly correspond with the former 2nd Grade Examinations in these subjects.

Elementary Stage (Subject 3a).*

(1 hour is allowed for this Examination.)

Candidates are required to make an outline drawing in pencil only from a group of three or more of the geometrical models and simple vases shown in Fig. 1.

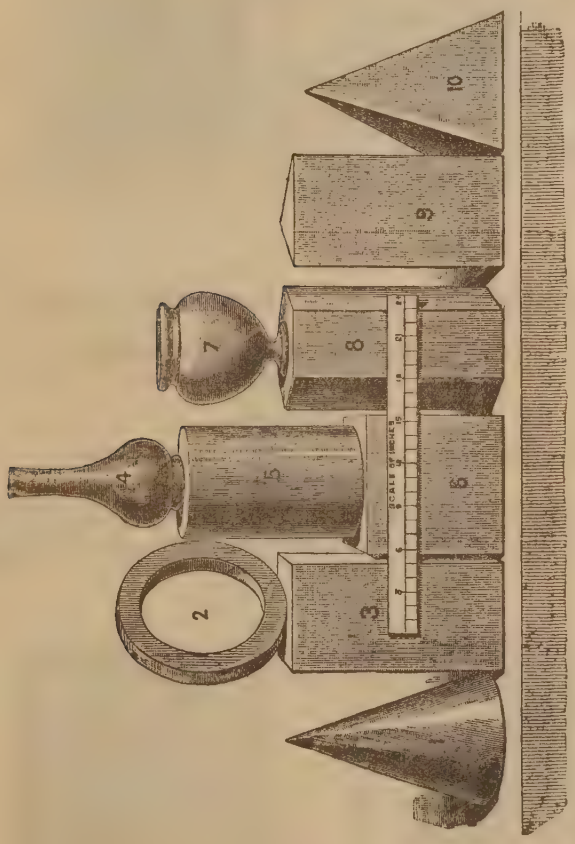

Fig. 1.

The drawing must fairly fill the quarter imperial sheet of drawing paper supplied to the candidate sitting for examination.

* These examinations nearly correspond with the former 2nd Grade Examinations in these subjects.

ADVANCED STAGE (SUBJECT 5A).

(2½ *hours are allowed for this Examination.*)

Candidates are required to make a shaded drawing from a group of three or more of the geometrical models and simple vases shown in Figs. 1 and 2.

The drawing must be made on a scale so that it shall fairly fill a half-sheet of imperial paper.

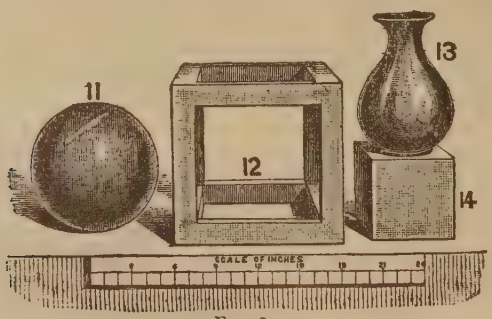

FIG. 2.

Drawing in Light and Shade from a Cast.

ELEMENTARY AND ADVANCED STAGES.

(SUBJECT 5B.)

ELEMENTARY STAGE.

(3 *hours are allowed for the Examination in this stage.*)

Candidates are required to make a shaded drawing from a cast of ornament similar to those shown below (*see* Figs. 1 to 5). But the Department will supply the examples for use at the Examination. The drawing must fairly fill a quarter imperial sheet of paper and must be slightly larger in size than the cast.

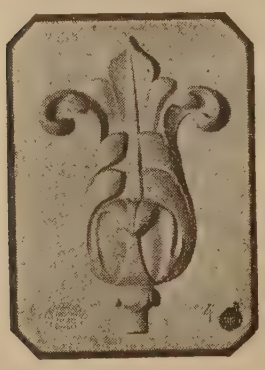

FIG. 1.

FIG. 2.

Fig. 3.

Fig. 4.

Fig. 5.

See N.B. on page 271.

Advanced Stage.

(*4 hours are allowed for the Examination in this stage.*)

Candidates are required to make a shaded drawing, which must be slightly enlarged, from a cast of fruit or foliage, or from a rosette, centre of a scroll, or other cast of ornament in high relief, similar to those shown below (*see* Figs. 6 to 8). But the Department will supply the examples for use at the examination. The drawing must fairly fill a half imperial sheet of drawing paper.

Fig. 6.

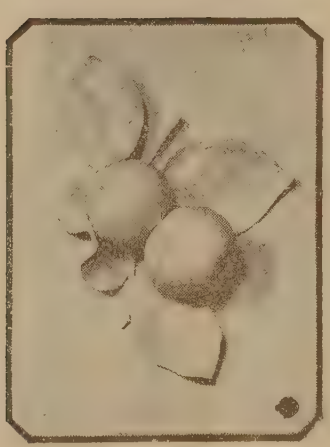

Fig. 7.

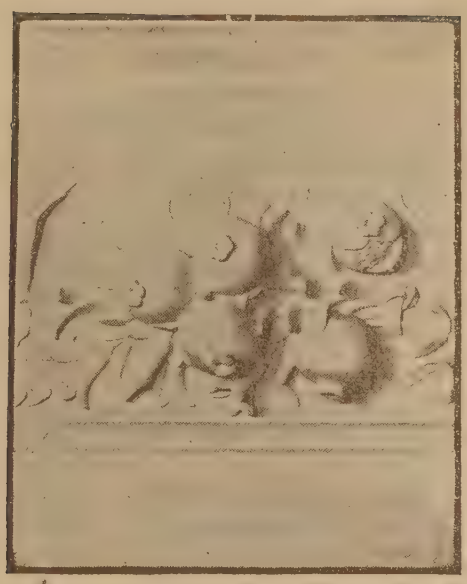

FIG. 8.

N.B.—In respect of both stages the casts selected for use should be hung before the candidates in such a way that each of them is lighted by only one light. The size of the casts should be in fair proportion to the size of the drawing paper upon which the candidate is required to do his work.

Geometrical Drawing (Art).

(3 hours are allowed for this Examination.)

This subject is intended to embrace elementary plane geometrical constructions relating to lines, circles, and tangents to circles; the use and application of compass, set squares, T square and plain scales. Methods should be explained of setting out and dividing surfaces.

The problems set will be limited to simple constructions in the following sections:—

(1) *Constructions required in geometrical pattern drawing, simple tracery, and mouldings.*

(2) *Construction of regular polygons—general method. Inscribed and circumscribed circles. Simple cases of rectilinear figures described in or about other rectilinear figures.*

(3) *Circles—passing through three points—touching three lines. Tangent lines and circles to one or two circles.*

(4) *Construction of irregular polygons from given sides, angles, and diagonals. Similar figures—equal, enlarged, or reduced.*

(5) *Plain scales and scale of chords. Proportional division of lines, including the mean, third, and fourth proportionals. Reduction of polygons to triangles of equal area. Construction of a parallelogram or square equal to a given triangle or other rectilinear figure.*

(6) *Elementary constructions of the ellipse—its tangents and normals.*

(7) *Plans, elevations, and sections of simple right solids—the cube, prism, cylinder, cone, and sphere—in simple positions.*

(8) *Direct constructions of the parabola, hyperbola, and spirals. Cycloids, Ionic volute, and forms of arches.*

Perspective

AND SCIOGRAPHY.

In the examination questions the following terms will be used with the meanings here attached to them:—

Ground line.—The intersection of the ground plane with the picture.

Picture line.—The intersection of any plane (except the ground plane) with the picture.

Vanishing parallel of a given line.—A line drawn through the eye parallel to the given line.

Horizontal trace of a plane.—Its intersection with the ground plane.

Inclined plane.—A plane inclined to the ground plane and having its horizontal trace perpendicular to the ground line.

Ascending } plane.—A plane inclined to the ground plane, and having its
Descending } horizontal trace parallel to the ground line.

Oblique plane.—A plane inclined to the ground plane, and having its horizontal trace neither perpendicular nor parallel to the ground line.

Vanishing point of the inclination of a plane.—The vanishing point of a line in the plane at right angles to the horizontal trace of the plane.

ELEMENTARY STAGE (PERSPECTIVE ONLY).

(SUBJECT 1c.)

Candidates in the Elementary Stage must be prepared to solve problems in Section I., and to answer questions in Section II.

Section I. Candidates are required to represent in perspective from plan and elevation, or from specification, simple solids or objects of plane or curved surfaces having one line or surface on or parallel to the ground plane. This may be done either by the direct method or by the use of vanishing points. By the direct method is meant the deduction of a perspective view direct from the plan.*

Section II. Candidates will also be expected to answer some simple questions on the theory of perspective.

ADVANCED STAGE (PERSPECTIVE AND SCIOGRAPHY).

(SUBJECTS 1c and 1e.)

Candidates in the advanced stage must be prepared to solve problems and answer questions, one or more, in *each* of the following Sections:—I., II., and III.

NOTE.—In Sections I. and II. a knowledge will be required of vanishing lines of oblique planes, vanishing points of shadows, &c.

Section I. Problems such as are given in the Elementary Stage (Section I.), but more difficult in character.

Drawing and measuring lines inclined to the horizontal, and contained in vertical planes inclined to the picture plane.

Figures or solids in perspective, some of whose leading constructive lines are horizontal, and the others contained in vertical planes at right angles to the horizontal lines, e.g., a cube with one edge horizontal and one face making a given angle with the ground.

Solids having plane or curved surfaces in oblique positions, and all their constructive lines inclined to the ground. Such representations being limited to problems which can be solved by the treatment of an oblique plane and perpendiculars thereto.

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* The requirements for the elementary stage in the *practice of perspective* will correspond, as nearly as may be, with those previously demanded for 2nd Grade Examinations.

Reflections of such solids in plane mirrors, horizontal or vertical.
Shadows of lines, surfaces and solids, rectilineal or curved, upon any specified planes and on surfaces of single curvature, by natural or artificial light.

Section II. Definition of theoretical terms in use;
Clear description of all the constructions employed;
Reasons underlying their employment.

Section III. By means of Orthographic Projection to define the shades on and shadows cast by—
Simple solids (rectilineal or of single curvature) and combinations of such solids.
Simple forms of architectural or mechanical details.
Solids of double curvature, e.g., sphere, hollow sphere, vase, baluster and cup forms.
Position of solids:
Axis parallel to one of the planes of projection.
Inclined in any position.
Conditions of lighting:
Sunlight:
(*a.*) Rays represented in plan and elevation at 45°.
(*b.*) Rays in any specified direction.
Artificial light.
Shadows received by—
Planes—(*a*) vertical or horizontal; (*b*) inclined*; (*c*) oblique (given by their traces).
Surfaces of single or double curvature in any position.

Historic Ornament.

(SUBJECT 22D.)

Candidates sitting for a second class only will be required to answer questions relating to DECORATIVE ART applied to furniture and utensils.

Those sitting for a first class will have in addition to answer questions relating to ARCHITECTURAL ORNAMENT.

All answers (in respect of DECORATIVE ART as well as ARCHITECTURAL ORNAMENT) should be very fully supplemented by good sketches and drawings, and high marks will be given for good draughtsmanship.

1. PREHISTORIC architectural and other ornaments and cognate forms in use among savage tribes.

2. EGYPTIAN and ASSYRIAN columns and appendages, mouldings, surface sculpture, and painting applied to architecture. Sculpture on a colossal scale, metal work, jewellery, wood and ivory carvings, furniture, pottery, textiles, manual arts as shown in illustrated books, and actual specimens at the British Museum and South Kensington.

3. GREEK columns and appendages, mouldings, panels, acroteria, ETRUSCAN and GREEK sculpture of various periods, arms and armour, metal work, ivory and gold statuary, jewel work, pottery, gems and coins.

4. The same arts on a larger and more sumptuous scale under the ROMAN and GRECO-ROMAN artists, from the days of Greek independence to the age of Constantine.

5. BYZANTINE, ROMANESQUE, NORMAN architectural decorative details:—columns, capitals, &c., mouldings. Sculpture belonging to the same styles, mosaics, paintings, enamels, jewellery, engraved crystals and gems, coins, costume as seen in specimens in the British and South Kensington Museums and in illustrated books; the Byzantine influence on the decorative arts of southern and western Europe.

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* An inclined plane is to be taken to mean such a plane as is represented in elevation by a single line, *i.e.*, its horizontal trace is perpendicular to the vertical plane of projection.

6. Mediæval architectural ornament, columns, capitals, mouldings, panels, spandrils, crestings, corbels, tabernacles, pinnacles, pendants, parapets, &c. Mediæval sculpture, painting, metal work, arms and armour, enamelling, tapestries, textiles, mosaics, goldsmith's work, wood and ivory carving from the 12th to the close of the 15th century.

7. Revival of ancient learning in the 15th century, its influence on the architectural and sumptuary arts, on the decorative features of architecture, and on all sumptuary arts, including majolica, lace, leather work, and ornament in every kind of material.

8. Eighteenth century. Discovery of Herculaneum and Pompeii, return to Greek and Roman forms and decoration.

9. Ornamental details of the Architecture of the East: of Persia, Japan, and China. The Saracenic Architecture of Egypt, Syria, and Spain, and the Saracenic and other architecture of India.

10. Oriental Sumptuary Art as originating from Persia, with some Byzantine traditions. Damascened and wrought metal work, pottery, painted and inlaid wares, textiles, &c. Figure and flower painting as elements of Persian decoration. Arabian art and the geometric character of its ornament. Skill of Indian craftsmen in the arts of Persia. Indian goldsmiths' work showing traces of Greek traditions.

11. Chinese and Japanese Ornament. Jade and ivory carving, enamelling, porcelain, bronze casting on a colossal and on a minute scale; lac work, block printing, silk and cotton weaving practised from remote times in China and Japan.

Principles of Ornament.

ELEMENTARY AND ADVANCED STAGES.

(Subject 22.)

Note.—In order to prepare for this examination the student must acquaint himself with the geometrical figures composed of straight and of curved lines; with right-lined and curved figures, and the mixture of both that have been used to contain ornament in the shape of panels, frames, diapers, &c.; he must study the leaves, flowers, and fruit of those plants that have been employed for floral ornament, such as the honeysuckle, the ivy, the laurel, the bay, the vine, the acanthus, the single parsley, the oak, and the thistle; he must then compare the original with examples of its application as ornament to plain and curved surfaces; carefully observing what parts of the natural form have been employed, and what parts have been rejected to form conventional ornament by the Greek, Roman, Byzantine, and Renaissance masters, and endeavour to discover why part is used and part rejected.

The principles deduced from the observation of nature, and of good ornament, are called the laws of ornament, and are given in the accompanying syllabus.

It will be found on examination, that the parts of plants are set out on a geometrical basis, most easily seen in the section of stalks, buds, fruits, &c., and in the plans of flowers; the arrangement of the leaves and flowers on their stalks are also set out on a geometrical basis, though often obscured by the growth of the plant, and the overlapping of the leaves, and all good ornament is also set out in a similar way. The student should observe that in smooth edged leaves, convex on both edges, symmetry is rarely found, the central rib does not divide the leaf into two similar parts, but the effect is gained by balance; one edge is also more convex than the other, by which variety is gained. In trailing and creeping plants, the vine of the pumpkin may be instanced, twists often occur in the stalk, that exemplify the vigour of its growth, and this has been used by ornamentalists with good effect. The first opening of leaves and flowers from their buds, and the early growth of plants, particularly when they burst from a capsule, are characterised by vigour of growth, and attention should be paid to the use made of these in ornament.

Certain elegant and strikingly shaped flowers, such as those of the pumpkin, the Turk's-cap lily, and the parrot tulip have occasionally been used as centres or bosses among acanthus foliage, though in good ornament they are mostly made up of other elements.

When these flowers have been drawn, they should be compared with the flowers used in Roman and Renaissance work to learn how they have been treated, and the same comparison should be made as to the treatment of fruits growing on their stalks, and of tendrils.

To give interest and variety to floral ornament, insects, reptiles, fish, birds, and quadrupeds, human and mythical forms have been introduced, as well as the works of nature and of men; of the former, the sun, moon and stars, the sea, rivers, mountains, trees and shrubs have been most frequently used, the latter may be roughly grouped into buildings, ships and boats, furniture, arms, armour, and standards, musical instruments, utensils, festoons, and garlands, dresses, hangings, fringes, ribbons, &c.; not only must their appropriate introduction be studied, but their scale and treatment, when used as ornamental accessories.

The foregoing remarks have been mainly confined to decoration in the flat, but much ornament has been expressed by modelling, which may be in the round, or in high or low relief; though the principles are the same, the effect of modelled work depends on the shade and shadows produced by the particular lighting, and on the heights and distances or the ornament from the eye. The fitness of ornament for its place has also to be considered. Theoretically there may be unfitness in flat ornament, but this unfitness is purely æsthetic. We can walk on a carpet however unfit the pattern may be for its place, but this may not be the case in relief ornament. We may be unable to walk with bare feet on the sharp edged pavement of a bath, to wield a sword whose hilt is carved in spikes, or to lift a flagon whose handle is too close to its body, or is prickly; there may be as well an inappropriateness to the mind in relief ornament which has to bear weight looking too weak for the purpose.

The advanced student must notice the good or bad effect of certain lines or masses on each ornamental composition; the study of the examples of the Greek honeysuckle cannot be too strongly recommended, and also the devices resorted to for giving due effect to ornament in certain positions and for certain purposes. Rigidity and simple repetition are best adapted to the important parts of monumental work, while greater flow and breadth may be given to less important parts and less important subjects. In the foliated capitals of large columns, far away from the eye, confusion and spottiness are mainly to be avoided. The grand capitals of antiquity are a treasury of instruction, and those who aspire to become masters cannot study them too deeply. The introduction of horizontal lines at regulated intervals in the panels of Roman and Renaissance pilasters should be studied, as they give the stability and repose needed in subjects with a preponderance of curves. The introduction of skulls, bones, and other ghastly things should be avoided, since we have ceased to sacrifice victims on our altars, there is no excuse for their introduction. Winged cupids, children, and animals are introduced to relieve the monotony of floral ornament and add other graces to it; these should be treated as part of the scheme of ornament and not overpower it.

Mediæval carving should also be studied, for if it be sometimes wanting in grace it is generally of a stonelike character and is admirably suited to catch sunlight by its angularity of execution and to show as ornament in dull weather by reason of its under-cutting or piercing.

Good draughtsmanship is indispensable for the explanation of ornament, the mere knowing the names and meaning of the laws, &c. without the power of illustration is of next to no use to the students. They are recommended during their rambles to sketch at once any suggestion that may attract their attention by its grace or power in vegetable or animal forms, or in existing ornament. Some of the most successful compositions of the great masters owed their origin to figures, groups, or incidents seen and sketched in their leisure hours, and these incidents were often so transitory that the leading features could only be noted by the merest scrawl.

Elementary Stage.

The subjects for examination will be:—

Those Forms composed of Right and Curved Lines that have been

used for the ornamentation of floors and as inlays and borders, including drawings of their use, and these drawings must show as much of the floor, and border, or the combination of both as will explain the patterns and the contrast between the floor and border; also drawings and explanations of the geometrical forms used as separations between floral borders and floral centres.

Illustrations of the same forms, and those compounded of them when used as the boundaries of panels, medallions, and diapers, with sketches of good examples of the floral ornaments that have been used to fill them.

THE NAMES OF THE LAWS OF ORNAMENT and for its COMPOSITION from the syllabus, with illustrations of their occurrence in the vegetable kingdoms, and of their application in pieces, and in schemes of ornament, and also illustrations of ornament not conforming to these laws.

THE NAMES OF THE CLASSES OF ORNAMENT, with illustrations of each from well-known examples.

THE NAMES OF THE STYLES OF ORNAMENT, with illustrations of each from well-known examples.

THE HARMONIC PROPORTIONING of the divisions of plane walls, floors, and ceilings, by means of panels, bands, borders, &c., and also of the borders of the panels to the whole area of the panel or to the height of the band.

THE FILLING OF SPACES by spotting, powdering, lining, striping, chequering, or diapering, &c., to contrast with floral forms on borders, &c.

THE ILLUSTRATION OF SIMPLE SOLIDS of square, oblong, triangular, or circular section, showing them harmoniously proportioned by means of painted lines, or of plain, raised, or sunk mouldings.

THE ILLUSTRATION OF BEAKERS, vases, flagons, cups, saucers, and plates, of boxes, caskets, chests, pedestals, tripods, &c., of elegant, common-place, and ugly forms.

ILLUSTRATIONS OF APPROPRIATE CARVED ENRICHMENTS for bands and variously curved mouldings.

ADVANCED STAGE.

This examination will include the Elementary course, but the candidates will be expected to show a more thorough acquaintance with the principles and practice, as well as better draughtsmanship.

The additional subjects candidates will be examined in are as follows :—

THE TREATMENT OF CARVED FOLIAGE in the round, in high, middle, and low reliefs, and in sunk or intaglio work.

THE TREATMENT OF THE LEAVES and floral ornament in large capitals of columns.

MONOGRAMS and CIPHERS.

THE TREATMENT OF ORNAMENT IN THE FLAT, AND IN RELIEF on curved surfaces, such as on vases, &c., and on vaults and domes.

THE TREATMENT OF ANIMALS IN CONJUNCTION WITH FLORAL ORNAMENT, including mythical animals, such as the chimæra, the griffin, the wyvern, the phœnix, the winged dragon, winged sea monsters, and winged horses both of the land and of the sea.

THE PROPER TREATMENT OF HUMAN FIGURES IN FLORAL ORNAMENT, and of mythical forms, such as winged figures, satyrs, centaurs, sphinxes, sirens, harpies, mermaids, martichores,* the human-headed serpent, &c.

UNDERCUT ORNAMENT such as is found in Byzantine capitals, and in Gothic mouldings, &c.

PIERCED AND OPEN WORK, when the unpierced face is flat, and when it is in relief, as in pierced marble balustrades, in pierced woodwork, in cast and wrought-iron railings, gates, &c., and in wooden lattice work similar to that of the Saracens.

THE EFFECT OF DIFFUSED LIGHTING and of lighting from various points on relief ornament.

The reduction in height of moulded profiles, &c.

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* The original martichore was a lion with a man's head and bust, but the word is applied to stags with men's and women's heads and busts.

The methods of compressing or enlarging ornament when a series of panels of the same height, but of different lengths, or of the same width, but of different heights have to be treated with the same scheme of ornament.

The different treatment of Wood, stone, and metal when in juxta-position.

The treatment of Trophies formed of arms, armour, and standards, of implements and utensils, and of natural or artificial products.

Attention is called to a device of the Byzantines for producing variety in flat carved ornament by causing parts of the ground to bulge out, which is susceptible of great improvement and extension.

The treatment of ornamental Panels containing figures, buildings, hangings, trees, and landscape.

PRINCIPLES OF ORNAMENT.

I.—*Definitions.*

Ornament is the application of beautiful forms or colours to enrich an object.

Direct transcripts from nature rarely become ornament.

Ornament has no independent existence.

Inappropriate enrichment is not ornament.

II.—*Methods of Expression.*

Modelled, relief, or sunk ornament, is defined in shape by light, shade, and shadow, and may also be treated with colour. Ornament on a flat surface is produced by lines or by flat tints of colour in juxta-position, or by the imitation in painting of relief or modelled work.

III.—*Elementary Forms.*

The geometrical forms with which ornament may be constructed, or which may be used for enclosing ornament are :—Straight lines and the rectilinear figures formed by their crossing or meeting in horizontal, vertical, and oblique directions, such as—

The stripe.	The diamond.
The triangle.	Polygons.
The square.	Network, &c.

Regular curved figures, closed or open, and forms made from the combination of these, such as—

The circle,	Waves,
The ellipse,	Meanders,
The parabola,	Scrolls,
The hyperbola,	Festoons,
The catenary,	Imbrication,
Spirals,	&c.

and by the conjunction of both as in diapers.

IV.—*Laws of Ornament and for its Composition.*

The laws that have been deduced from the observation of the forms of nature and of good ornament are:—

Proportion.	Stability.
Repetition.	Subordination.
Series.	Repose.
Variety.	Geometrical arrangement.
Contrast.	Growth.
Radiation.	Superposition.
Tangential junction.	Fitness.
Symmetry.	Unity.
Balance.	

The effect of certain ratios between the height and width of objects of regulated distances between lines, or the regulated widths of stripes and of the distances between them, of certain regulated alternations of roughness and smoothness, of ornament and plain surface, of voids and solids, is more agreeable to the eye than other ratios, distances, or alternations. Objects or patterns so set out are said to be in harmonic proportion.

V. *Division of Surface.*

Plane surfaces such as floors, walls and ceilings, may be divided into panels of various shapes, square, oblong, polygonal, circular, oval, &c. they may be wholly covered with network or diapers. They may be wholly banded or striped, or two or all of these methods may be combined.

Curved surfaces such as the soffits of vaults or domes may be treated in the same way, only the horizontal bands form rings, and in domes the vertical stripes are called ribs.

In the setting out of the panels, bands, or stripes, harmonic proportion should be sought, and the borders of panels or bands should be in harmonic proportion to the panels or bands.

VI. *Solids.*

Large solids are treated by the architect, small ones by the ornamentalist, the object is to make them fit for their use in accordance with the material they are to be made of, and then to give them beautiful proportion and outline, regard being had to their perspective effect, and this is particularly necessary in the case of triangular pieces. Each piece should have one part predominant, except where they are symmetrical on a central horizontal axis.

VII. *Variety of Surface.*

Sectional form is broadly divided into the flat, the convex, and the concave, and may be infinitely extended by the joining of these together in varying proportions and positions, and by differences in the curves; all entablatures, bases, and series of mouldings come under this head. Texture may be divided into the rough, the smooth, the polished, or the burnished, and may be infinitely extended by using them in conjunction in varying proportions, and with various sorts of roughness, as may be seen in the treatment of metal, marble, stone, wood, and leather work, and in woven stuffs.

VIII. *The Setting out of Ornament.*

All schemes of ornament should be set out on a geometrical basis.

As a rule floral ornament on the same plane should spring from one root or from two roots, one on each side of the centre. For superposed ornament on two planes the lower pattern should be small and form a ground for the upper one, which should be larger and stiffer, as in the text work of the Saracens; if a third plane is superposed a geometrical pattern is the best.

Ornament should be strictly confined to the spaces enclosed by the structural lines. The examples of plates where one pattern runs over the bottom bevel and edge are to be avoided. In the case of curved forms each ornament should be confined to such part of the curved surface as will not cause its distortion.

Where ornate friezes, bands or panels are used to ornament portions of one large surface the intervening parts should be plain or covered by simple forms in the shape of spotting, powdering, lining, striping, or matted work and should not distract attention from the main ornament. In certain cases this effect has been attained by making the ornament of the subsidiary parts in such low relief that it appears at a distance a mere roughening of the surface.

IX.—*Classes.*

A. *Mnemonic.*—Where writing is introduced, or where signs or natural objects are used to aid recollection.

B. *Symbolic.*—Where the thing represented is endowed with a meaning, as of a duty, a dignity, an office, an attribute, or the like; for example, the winged globe in Egyptian, the thyrsus, and certain animals and plants in classic, the fish, the vine, &c. in Christian ornament.

C. *Æsthetic.*—For the purpose of charming the eye without special regard to a mnemonic or symbolic purpose.

X.—*Styles.*

A. *Realistic or Natural.*—Where an actual or natural object is simply copied and applied.

B. *Conventional or Abstracted.*—Where only those forms and qualities are represented that fulfil the required end of ornament, as curves representative of growth or elegance in flowers and plants.

C. *Naturalistic.*—Forms not necessarily imitated from nature, but similar to those employed by nature in decorating the skins and feathers of animals.

Candidates for the Elementary Examination must give examples from this syllabus, supplemented, where necessary by an enlarged description from the books referred to, including examples of infractions of the laws, &c., and illustrate all their answers with the best sketches they can make.

Architecture.

(Subject 1d.)

I.—The Orders Greek and Roman.

The word "order" as applied to architecture. Its meaning as a combination of a column and its usual superstructure, or entablature. This combination, almost the only means of producing architectural effect employed by the Greeks, and the chief feature of Roman architecture. The term order as possessing also a wider significance and extended to denote a style or manner in keeping with one of the varieties of column in use in classic times.

The Greeks' use of the orders Doric, Ionic, and Corinthian. The Romans' addition of two others, namely, Tuscan and Composite, so raising the number of orders to five.

Candidates are expected to make themselves familiar with the forms and general proportions of good examples of the orders—both Greek and Roman—so as to be able to draw them from memory with correctness, but it is not required that the dimensions of the minute subdivisions of height and projection which are met with in the books on the subject should be committed to memory.

II.—Mouldings made use of with each order; the capital considered as the index to each; the enrichments applied to the various mouldings; and the ornaments customarily made use of.

Candidates must be prepared to draw some of these from memory.

III.—Sources from which the orders were derived. Rudimentary and somewhat archaic forms in which they appear in early Greek work. The mode in which they were employed by Greek architects and by the Romans, including the way in which the latter combined arches with columns, and employed pedestals, thus variously extending the scope of the orders. The use made of the orders by Renaissance architects and the variations introduced.

From the first the attention of the student should be directed to the points of distinction as well as of resemblance between the Greek and Roman orders, extending to the mouldings, enrichments, and ornaments, as well as the leading forms and proportions; and to the wide difference in architectural character thus created.

IV.—General Knowledge. Terms in ordinary use in architectural books.

Candidates will be required to illustrate their answers under this head by sketches.

V.—Buildings of architectural character—Renaissance, Mediæval, or Modern.

Candidates will be required to answer questions about buildings with which they are familiar, and the styles in which they are built, and will be asked to draw them or parts of them from memory.

Candidates cannot be too strongly impressed that architecture consists of buildings, not of representations of them; and that making studies of good specimens of architecture from buildings, or in the case of ornaments, &c. from casts, is the best way of obtaining proficiency in architecture. Such studies are often more instructive if drawn geometrically and to scale than if attempted in perspective.

Accuracy, combined with freedom, in draughtsmanship will always be taken into account in adjudging marks, and a thorough appreciation of the character of any object represented is of equal importance with the exact reproduction of the main proportions and prominent forms.

Candidates desiring to obtain a second class must be prepared to draw from memory, to scale, and with fair correctness, any of the orders Greek or Roman; and to a larger scale, portions of the mouldings, enrichments, capitals, or other features; and to answer questions on the architectural terms in general use.

Candidates desiring to obtain a first class must be able to do the work indicated above as required for the second class but with more precision and completeness; they must also be prepared in some of the other branches of study indicated above, though not necessarily in all of them; and their draughtsmanship must be of good quality.

Architectural Design.

(Subject 23b.)

Candidates will be required to design a building, or some portion of a building, in conformity with a statement of requirements, or upon a sketch plan, furnished to them, and to carry out its architectural treatment in some definite style.

The object of the examinations is to show that the candidate possesses a competent knowledge of the decorative features and ornaments employed in some one style of Architecture, such as Classic, Renaissance,

GOTHIC, &c., and the ability to use them. Any style to which the above description will apply may be selected.

1. In PLANNING a building, or in REVISING THE PLAN of one, the MASSES must be thrown into such a shape as will admit of a satisfactory TREATMENT OF THE EXTERIOR; and both the PLAN and SECTION must secure that the INTERIOR (or each part of it if it be cut up into halls or rooms, &c.) be of GOOD PROPORTIONS and capable of satisfactory DECORATION.

Attention to these conditions must be combined with due attention to carrying out the statement of requirements, and to arranging for good access, lighting, and general convenience.

2. A good BALANCE of openings and solids and good PROPORTIONS are essential to a successful DESIGN; and when the general lines have been settled, appropriate ARCHITECTURAL DECORATION must be added. This does not simply mean ornament, it implies a familiarity with and the ability properly to introduce all that goes to make up ARCHITECTURE.

For example, in a CLASSIC DESIGN the candidate must be able to introduce suitable RUSTICATION, the ORDERS, possibly a DOME, and the usual TREATMENT OF OPENINGS, CORNICES, BALUSTRADES, PANELS, &c., with their appropriate MOULDINGS, ENRICHMENTS, and ORNAMENTS.

If the style be GOTHIC the candidate must show that he is familiar with, and can correctly employ, ARCHES, BUTTRESSES, VAULTS, HIGH ROOFS, DORMERS, TRACERY, CARVING, &c., such as were in use at the period which he selects.

Sufficient and correct knowledge of at least one style; draughtsmanship which while exact and true shall yet be free and spirited; and a little skill in the putting together of the parts of a design, such as is best acquired by practice and by study of existing buildings of good architecture, are the qualifications essential to success in this examination. The degree in which these qualifications are shown in the design will determine what award shall be made for the candidate's work.

Anatomy.

(SUBJECT 9.)

The examination questions in this subject will be given with the object of testing the candidates' knowledge of certain truths which every representation of the human figure must embody, or be wrong.

Candidates will be required to illustrate their answers as fully as possible with good sketches, for which higher credit will be given than for elaborately written descriptions.

The following statement includes the more important subjects which should be studied.

The ESSENTIAL AND DISTINCTIVE CHARACTERS OF THE HUMAN FORM. The divisions and regions of the body.

The PROPORTIONS of the normal adult male and female; the wholly different proportions of the infant; and the metamorphosis of the infantile into the adult form in consequence of the different modes of growth of the head, trunk, and limbs.

The STATIONARY FIGURE.—The causes of the reliefs of the surface of the skin mainly to be sought in the subjacent structures—bone, muscle, tendon, fat, and glands. Elementary exposition of the nature of these structures.

The FIGURE IN MOTION.—The modification of reliefs consequent, directly or indirectly, on changes of the form of muscles. Elementary exposition of the effects of contraction on the form of muscles. Experimental demonstration on

the muscles of a frog's leg. Illustrations on living model, *e.g.*, changes of relief in the upper arm and in the calf of the leg in consequence of the contraction of biceps and gastrocnœmius.

The Skeleton as the framework of the body. The spinal column, with its ligaments, as a whole; its curves: the range of motion of its parts. The skeleton of the thorax as a whole. The range of motion of the ribs and the sternum. The fixation of the spinal column into the pelvis. The inclination of the sacrum and of the plane of the brim of the pelvis to the vertical axis of the body. The differences in the proportions of the pelvis in the sexes.

The connexion of the skull with the spinal column and its consequent possibilities of motion. The calvaria and the face; broad and long, high and low skulls; prognathism and orthognathism; varieties of the malar region, and in the form of the orbits and lower jaw; the chin prominence. Different characters of the skull and face in men, women, and children.

The skeleton of the upper limb. The normal position of the shoulder blade and the surface reliefs to which it gives rise. The forms of the articulations as influencing reliefs and limiting the extent and the character of the movements of the parts of the limb on one another, with especial reference to pronation and supination of the hand and the possible positions and movements of the thumb and fingers.

The haunch-bone as a determinant of form. The skeleton of the lower limb treated in the same way as that of the upper limb. The tarsus (as a whole) and the setting on of the toes.

The Muscles, so far as they determine the outward form of the body. The muscular constitution of the walls of the abdomen; the changes consequent upon various attitudes. The muscular masses of the back and neck. The larynx, so far as it affects the form of the throat.

The superficial muscles of the limbs. The anatomical reasons for the reliefs and depressions of the skin of the hand and foot. The normal hand, with the proportions and possible positions of the digits. The nails and the distribution of hair on the hand. The area of contact of the sole of the foot with the surface in standing. The "arch" of the foot. The normal proportions and the relative positions of the toes.

The brow, eyelids, and visible parts of the eyeball. The nose, lips, and chin. The parts of the externally visible ear. The muscles of the jaws. The relations of the skin of the face to the subjacent parts at different periods of life.

The positions of the parts of the face which constitute the various forms of expression. The general arrangement of the muscles, the contraction of which brings about these positions.

Design.

Elementary Stage.

(Subject 23c.)

Surface decoration.

I. Candidates for examination will have to make designs to fit given spaces, such as a square, a triangle, a circle, a spandril, a lunette, a pilaster, a panel, &c., &c.

Such designs may consist of:—

A. Ornament composed of straight lines only.
B. Geometric ornament (not confined to straight lines).
C. Interlacing ornament (not strictly geometric).
D. Scroll-work.
E. Foliated or floral ornament.

II. Candidates will have further to design repeating patterns :— Repeated pattern.
A. Straight lined,
B. Geometric,
C. Interlacing,
D. Of scroll-work,
E. Foliated or floral,

and to design them on given lines. That is to say, they may be called upon to make their design a "sprig" pattern, for example, or a "trellis"; or to set it out on the lines of the square, of the parallelogram, of the hexagon, of the diamond; or they may be asked to design it as a "drop."

Again, the pattern may be for a border, straight-lined, geometric, or what not (A, B, C, D, E); or for some particular kind of border, vertical, for example, or horizontal, or in the nature of a frame with corner; or, yet again, the border may be more precisely defined, as a fret, for example, a wave, a border in compartments, or one broken by rosettes or pateræ, and so on.

III. Drawings, whether for school exercise or for examination, should be not in pencil merely, nor in outline, but in water colour; and the design should be washed in to show dark against the ground, or the ground washed in leaving the design light upon it, with or without an outline. The design may be in black and white or in two tints of colour (not more). In the latter case the two colours should be harmonious or in pleasing contrast. The colouring need not be absolutely flat; but there should be no shading, nor any attempt at relief; it should define the design and not confuse it. The drawing should be neither vague nor sketchy, but clean and precise. The manner of drawing.

Note.—It is not thought necessary to insist, at this elementary stage of instruction, upon the adaptation of designs to execution in any specific material or by any specific process; but the teacher is reminded that the pupil cannot too early have impressed upon him the necessity of considering, in every design he makes, the use or purpose to which it could practically be put.

Advanced Stage.

(Subject 23c.)

I. Candidates for examination must not only have studied the Historic Styles of Ornament, but must be able to make a design for a border, for example, a diaper, a panel, &c.) in the Greek, Roman, Early Gothic (13th century), Renaissance (Cinque Cento), or Moresque manner. Historic style.

Note.—Such studies will inevitably be more or less in the nature of reminiscences, but teachers should see that they are not reproductions of any existing examples; they should encourage the student to give full play to his own invention, so long as what he does would not appear incongruous or out of keeping with work of the period given.

II.—Candidates must have had practice in making designs for panels, pilasters, friezes, borders, spandrils, &c. in which some well-known plant (selected for them) has been taken as a starting point. Conventional treatment.

Such designs should in every case be adapted to some specific purpose, and to some specific method of execution; and teachers are recommended to insist upon the mention of such purpose and method, in writing, on the margin of the drawing, in order that they may see that the student had a reason, and what reason he had, for the particular kind of convention adopted.

Note.—Here again the study of Historic Ornament will best help to explain what conventional treatment should be;—not that the student will there find natural forms ready adapted for his use, but that he will see how the ancient, mediæval, or oriental workman modified natural form to suit his ideas of ornament.

III. Candidates should be generally acquainted with the various simple processes of workmanship, such as stencilling, colour printing, inlaying, wood Applied design.

carving, modelling, casting, &c., so as to be able to make a design which is practically adapted to execution in a given material or by a given method.

Note.—Teachers should see that the student is never allowed to make a design without a very clear notion as to how, from beginning to end, it could be carried out. There is more to be learnt from making a simple design well suited to its purpose than from elaborating the most ambitious drawing adapted to no purpose or process of execution.

Original design. IV. For the Examination candidates will be called upon to make, not merely designs in a given style (as in paragraph I.), or on the basis of a given plant (as in paragraph II), but original designs adapted to some specific purpose.

They may be asked, for example, to make a design for some particular object, for a pavement, perhaps, a ceiling or a frieze, a book cover, a vase, a fan, or what not.

Or they may be asked to make a design adapted to some special process of execution, for inlaying, for process printing, for weaving or embroidery, for embossing, modelling, and so on.

The manner of drawing. They will have to execute their designs in water-colour; a drawing in pencil or in outline merely will not do. Even though the design be in black and white, it must be washed in, to show light on dark or dark on light, as the case may be.

When the design is for something in relief, the shading must be such as to explain the design, rather than to give the effect of actual modelling: it is a question of design, not of painting.

In the matter of colour there is no restriction, further than what the material or the purpose of the design may suggest; but, as in the case of shading, the colour should not be made use of to obscure the form but to help it.

Scale of drawings. V. Designs done as school practice as well as those for examination should be drawn, if possible, to the full size of execution; or at least they should be drawn to scale (to be figured, of course, on the drawing), and to a scale large enough to show the detail of the design; a mere *scheme* on a very small scale is not enough.

Where, as in the case of a design for a pavement, full-size detail is out of the question, it will be necessary to make a small sketch-plan of the whole and to draw a portion of the detail to large scale.

Drawings should, in fact, be as nearly as possible such as could be put into the hands of a workman to carry out.

Scope. VI. It is not expected that designs in this stage should in any case include the human or animal figure; but, if introduced, such figures must conform strictly to ornamental considerations.

Honours.

(Subject 23d.)

Subject. I. Candidates for honours will have to submit either:—

(A.) A scheme of decoration, with some one important feature of it drawn to full size, or to as large a scale as the paper supplied will allow; or

(B.) A panel or other important composition, drawn to full size, or to as large a scale as the paper supplied will allow, with a sketch showing the position it is meant to occupy.

Note.—It is assumed, of course, that Candidates for Honours are competent to pass, or have passed, the examination in the Advanced Stage, Subject 23c.

Adaptation. II. The design must be adapted to some specific method of execution, such as painting (in distemper, &c.), carving (in wood, &c.), engraving, glass painting, chromo-lithography, &c.; and it must be stated, in writing, on the drawing what that method is.

Figure, &c. III. The design must include either (1) the human figure, or (2) animal forms, or (3) some ornamental feature important enough to occupy a central position in a scheme of decoration.

Note.—A *Scheme* of decoration need not of necessity have any relation to architecture: almost any design too comprehensive to be carried out in its entirety in the time allowed for the examination would answer to the term—provided that it were all sketched in, and some important part of it were properly finished.

IV. Drawings may be either in water-colour or in ink; that is to say, they must be executed, either with the brush or with the pen, and must not be merely in pencil. Manner of drawing.

N.B.—Candidates who fail to conform in any way to the conditions plainly laid down, will forfeit all chance of passing the examination, in whatever stage.

Painting Ornament in Monochrome.

(Subject 11a.)

The exercises have to be executed on the specially coloured canvases supplied by the Department, the form, light, and shade, must be taken from a diagram which is issued as a confidential examination paper. The ornament must be painted in what is known as "Grisaille," and should be in agreeable relation with the colour of the ground, and not necessarily, therefore, made only of black and white.

Candidates may paint in oil or tempera only.

The coloured canvases to be used by candidates desiring to paint in tempera must be previously coated with size, and must be thoroughly dry before being given to candidates. Neither teacher nor candidates are allowed to prepare these canvases for tempera painting. The canvases must be treated by those in charge of the examination as confidential materials.

Candidates will be expected to sketch in the whole of the ornament, and finish as much as they can of it.

Painting from Still Life.

(Subject 15.)

Candidates are required to paint in colour a group of still-life objects, such as:—

A pewter inkstand filled with ink, a quill pen standing in it, another quill pen lying on a sheet of red blotting-paper which has been in use; or a plate with two or three oranges in it; and such like groups of objects.

The exercises must be executed on the canvases supplied by the Department.

Candidates may paint in oil or water colours.

Candidates using water colours must strain such paper as they are accustomed to use over the canvas, writing on their paper the examination number which is upon the slip fastened to the canvas. In order that they may do this, the canvas may be supplied to them before the time fixed for examination.

The directions for selecting the objects for the group must be treated by the superintendents of examination as confidential. The superintendents must have the objects arranged according to the instructions. This arrangement should be completed not more than half an hour before the time fixed for the commencement of the examination.

Drawing from the Antique.

(Subject 8B2.)

(*The examination in this subject may be held only in schools provided at least with four full-sized figures.*)

Candidates are required to draw in any point of view which may be selected by the examiner, from the cast of such a figure as that of the Venus of Milo, the Gladiator, the Antinous, the Discobolus, *or any modern figure, which may from time to time be approved by the Department as an example.*

The casts have to be arranged by the superintendents of examination before the candidates arrive.

Candidates' drawings may be executed in chalk or black lead pencil, at least 15 and not more than 18 inches in height, and on a half imperial sheet of drawing paper supplied by the Department.

Candidates are required to place a mark on the right hand of the drawing paper showing the height of the "horizontal line" (to indicate the level of the candidate's eye).

Drawing the Antique from Memory.

(Subject 8F.)

Candidates are required to draw from memory any one of the following figures in any point of view which may be selected by the examiner:—

The Standing Discobolus,
The Germanicus,
The Antinous, and
The Dancing Faun.

Candidates' drawings must be in outline at least 15 and not more than 18 inches in height, and may be executed in chalk or black lead pencil on a half imperial sheet of drawing paper supplied by the Department.

Shading is not expected, but proper indications of the more striking forms within the contour may be given, and marks will be allowed for them.

Drawing from Life.

(Subject 8C2.)

Candidates are required to draw from a nude male figure,* which has to be posed according to the confidential instructions issued to the superintendent of examination.

The studies must be executed in chalk or black lead pencil, on a half imperial sheet of drawing paper supplied by the Department, and must be at least 15 and not more than 18 inches in height.

Candidates are required to place a mark on the right hand of the drawing paper showing the height of the "horizontal line" (to indicate the level of the candidate's eye).

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* Where women candidates are to be examined a female model should be posed in the same attitude.

Modelling from the Cast.

(Elementary Stage only.*)

(Subject 18a.)

Candidates are required to model from one or other of the following examples:—

No. 344. Rosette from the Capitol, Rome.
„ 345. Another ditto.
„ 346. Another from the Cloisters of St. Maria del Popolo, Rome.
„ 2315. Ten Elementary Studies of Ornament.
„ 494*a*. Small Rosette from the Tomb of the Scipios.
„ 494*b*. Another ditto.
„ 1542*e*. Pilaster from Tomb of Louis XII.
„ 1543*e*. Another ditto.
„ 476*a*. Another ditto.
„ 476*b*. Another ditto.
„ 478. Madeleine Pilaster (or section of it).
„ 1641. Small Carved Panel, Tracery—Gothic.

The above reference Nos. are quoted from the list Nos. 30a and 34 (Lists of Casts) formerly issued from the Department. Copies of the Casts are exhibited at the South Kensington Museum.

The following three examinations† take place under the superintendence of Local Committees, &c. about May.

Modelling from Life.

(Subject 19h.)

Candidates are required to model a nude figure‡ in relief upon a panel about 24 inches by 14 inches.

Modelling from the Antique.

(Subject 19B[1].)

Candidates are required to model upon a panel about 13 inches by 9 inches, the subject of the examination, smaller than the original placed before them.

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* This nearly corresponds with the former 2nd Grade Examinations in Modelling.
† These examinations are held at local centres where candidates themselves are prepared to cast their own models.
‡ Where women candidates are to be examined a female model should be posed in the same attitude.

Modelling Design.

Elementary Stage.

(Subject 23e.)

Surface decoration.

I. Candidates for examination will have to model designs in relief—not a the round—to fit given spaces, such as a square, a triangle, a circle, a spandril, a lunette, a pilaster, a panel, &c. &c.

Such designs may consist of :—

A. Ornament composed of straight lines only.
B. Geometric ornament (not confined to straight lines).
C. Interlacing ornament (not strictly geometric).
D. Scroll-work.
E. Foliated or floral ornament.

Repeated pattern.

II. Candidates will have further to design repeating patterns :—

A. Straight lined,
B. Geometric,
C. Interlacing,
D. Of scroll-work,
E. Foliated or floral,

and to design them on given lines. That is to say, they may be called upon to make their design a "sprig" pattern for example, or a "trellis"; or to set it out on the lines of the square, of the parallelogram, of the hexagon, of the diamond; or they may be asked to design it as a "drop."

Again, the pattern may be for a border, straight-lined, geometric, or what not (A, B, C, D, E,); or for some particular kind of border, vertical, for example, or horizontal, or in the nature of a frame with corner; or, yet again, the border may be more precisely defined, as a fret, for example, a wave, a border in compartments, or one broken by rosettes or pateræ, and so on.

The manner of modelling.

III. Models, whether for school exercise or for examination, should be in relief. The design should be well defined, that is to say, the modelling should be neither loose nor sketchy, but clean and precise.

Note.—It is not thought necessary to insist, at this elementary stage of instruction, upon the adaptation of designs to execution in any specific material or by any specific process: but the teacher is reminded that the pupil cannot too early have impressed upon him the necessity of considering, in every design he makes, the use or purpose to which it could practically be put.

Advanced Stage.

(Subject 23e.)

Historic style.

I. Candidates for examination must not only have studied the Historic Styles of Ornament, but must be able to make a design (for example, moulding, frieze, capital, a diaper, a panel, &c.) in the Greek, Roman, Early Gothic (13th century), Renaissance (Cinque Cento), or Moresque manner.

Note.—Such studies will inevitably be more or less in the nature of reminiscences, but teachers should see they are not reproductions of any existing examples; they should encourage the student to give full play to his own invention, so long as what he does would not appear incongruous or out of keeping with work of the period given.

Conventional treatment.

II. Candidates must have had practice in making designs for panels, capitals, pilasters, friezes, borders, spandrils, &c. in which some well-known plant (selected for them) has been taken as a starting point.

Such designs should in every case be adapted to some specific purpose, and to some specific method of execution; and teachers are recommended to

insist upon the mention by the students of such purpose and method, in writing, in order that they may see that the student had a reason, and what reason he had, for the particular kind of convention adopted.

Note.—Here again the study of Historic Ornament will best help to explain what conventional treatment should be;—not that the student will there find natural forms ready adapted for his use, but that he will see how the ancient, mediæval, or oriental workman modified natural form to suit his ideas of ornament.

Applied design.

III. Candidates should be generally acquainted with the various simple processes of workmanship, wood, stone, and ivory carving, &c., metal working casting, &c. so as to be able to make a design which is practically adapted to execution in a given material or by a given method.

Note.—Teachers should see that the student is never allowed to make a design without a very clear notion as to how, from beginning to end, it could be carried out. There is more to be learnt from making a simple design well suited to its purpose than from elaborately modelling an intricate scheme of ornament adapted to no purpose or process of execution.

Original design.

IV.—For the examination candidates will be called upon to make, not merely designs in a given style (as in paragraph I.), or on the basis of a given plant (as in paragraph II.), but original designs adapted to some specific purpose.

They may be asked, for example, to make a design for some particular object, for a ceiling, a frieze, a capital, a vase, a casket, or what not.

Or they may be asked to make a design adapted to some special process of execution, for wood-carving, goldsmiths' work, casting (by the wax or other process), embossing, and so on.

They may have to execute their designs in the round or in relief.

Scale of models.

V. Designs done as school practice as well as those for examination should be modelled, if possible, to the full size of execution; or at least they should be modelled to scale (to be figured, of course, on the model), and to a scale large enough to show the detail of the design; a mere *scheme* on a very small scale is not enough.

Where, as in the case of a design for a ceiling, full-size detail is out of the question, it will be necessary to draw a small sketch-plan on paper of the whole and to model a portion of the detail to large scale.

Models should, in fact, be as nearly as possible such as could be put into the hands of a workman to carry out.

Scope.

VI. It is not expected that designs in this stage should in any case include the human or animal figure; but, if introduced, such figures must conform strictly to ornamental considerations.

Honours.

(Subject 23f.)

Subject.

I. Candidates for honours will have to submit either:—

(A.) A scheme of decoration, with some one important feature of it modelled to full size, or to as large a scale as the limits of size (36 in. high × 24 in. wide) will allow; or

(B.) A panel or other important composition, modelled to full size, or to as large a scale as the above dimensions will allow, with a sketch on paper showing the position the panel or important composition is meant to occupy.

Note.—It is assumed, of course, that Candidates for Honours are competent to pass, or have passed, the examination in the Advanced Stage, Subject 23e.

Adaptation.

II. The design must be adapted to some specific method of execution, such as carving in stone or wood, casting, stamping, hammering, or chasing in metal, and it must be specified on the model what that method is.

Figure, &c.

III. The design must include either (1) the human figure, or (2) animal forms, or (3) monsters forming some ornamental feature important enough to occupy a central position in a scheme of decoration.

Note.—A *Scheme* of decoration need not of necessity have any relation to architecture: almost any design too comprehensive to be carried out in its entirety in the time allowed for the examination would answer to the term—provided that it were all sketched in, and some important part of it were properly finished.

Manner of modelling.

IV. Models may be required either in the round or in relief as the examiner may prescribe.

N.B.—Candidates who fail to conform in any way to the conditions plainly laid down, will forfeit all chance of passing the examination, in whatever stage.

Additional Art Master's Certificates.

(Groups II., III., IV., V., and VI.)

In addition to the Art Master's Certificate, Group I., the following Certificates for different groups of subjects of instruction in Art are also granted to candidates who pass the prescribed examinations:—

Certificate for Group II.—(Painting, Drawing, and Design.)

Second Group.

This Certificate is granted to candidates who have obtained a Certificate of the First Group, and who have submitted satisfactory specimens of the following works:—

(*a.*) Subject 8*b*[2]. A Shaded drawing of a complete figure from the Antique. (On an imperial sheet.)

(*b.*) „ 8*d*. A Study of Drapery arranged on an Antique figure. (On an imperial sheet.)

(*c.*) „ 11, 12, or 23. A Decorative Painting in Monochrome of Ornament in grisaille on a coloured ground in oil colour or tempera. The form and light and shade may be taken from a cast or from a photograph or drawing, or may be designed. (On a sheet or canvas 30 in. by 7 in.)

The colour of the ground may be chosen by the student, and that of the ornament, which should be what is known as "Grisaille," though not necessarily made only of black and white, should be in agreeable relation with the colour of the ground.

(*d.*) „ 15*b*. An imperial sheet with a Group of Flowers painted from Nature in water-colour. It is desired that this shall be, as far as possible, a composition of flowers or flowering plants painted with proper relation to a real background, and arranged as a composition of colour.

(*e.*) „ 22*d*. A set of fifteen studies of Ornamental Design, showing the treatment of diapers, friezes, borders, panels, pilasters, &c., from original examples in colour or relief: either in the South Kensington Museum or elsewhere. The date, style, and local origin of the example must be given on each sketch, and the series should analytically illustrate modifications evolved during various periods. (On two imperial sheets.)

These studies should be coloured and shaded sufficiently to exhibit the treatment and modifications, and should not be highly finished specimens of still-life painting.

Sections should be given of those parts of relief ornament which can be easily shown in that way, such as mouldings, and in the representation of embroidery the direction of the stitching should be given.

Students in country schools may make their studies from works on Architecture or Ornamental Art, and should supplement them as far as possible from examples in local Museums and in churches or houses in the neighbourhood.

(*g.*) Subject 23*c*. A Drawing of a Flowering Plant (such as that drawn in (*f*) for Group I., page 65), with three distinctly different designs for patterns based on the plant. Each of these three different designs must be suited to the technical requirements of one of three different processes of manufacture; such, for instance, as embroidery, inlay, printing, wrought metal,

weaving, painting, &c. The process and material for which it is intended must be named on each design. One, at least, of these designs must be executed in body colour or tempera. (On an imperial sheet.)

and have passed "Good" or obtain a first class at the Art Examinations in—

(*h.*) Principles of Ornament (Advanced Stage).
(*i.*) Design (Advanced Stage).
(*k.*) Painting Ornament in Monochrome from a sketch or photograph as an exercise in decorative painting. (*See* (*c*) Subjects 12 and 23 above.)
(*l.*) Drawing in chalk from an Antique figure.

Certificate for Group III.—(Drawing and Painting the Figure and Still-Life.)

Third Group.

This Certificate is granted to candidates who have obtained Certificates of the First and Second Groups, and who have submitted satisfactory specimens of the following works:—

(*a.*) Subject 8c^2. A shaded drawing of a complete figure from the Life. (On an imperial sheet).

(*b.*) „ 8^d. Two studies of Drapery arranged on the Living model; the drawing of each figure to be not less than 12 inches in height. (The studies to be mounted on one imperial sheet).

(*c.*) „ 9*a*. Two drawings in outline of the same Antique figure or living model, or of one of two photographs from nude figures by M. Angelo in the Sistine Chapel; within one outline the bones of the figure are to be indicated, and within the other the muscles. (On two imperial sheets.)

(*d.*) „ 15*a*. A study of a Group of Still Life or flowers, as a composition of colour, in oil. (On a canvas 20″ × 24″.)

(*e.*) „ 17*c*. A painting in oil-colour of the Nude Figure from the life. For female candidates the figure may be partially draped, but the hands and feet must be exposed. (On a canvas not exceeding 36 inches in its longer dimension.)

(*f.*) „ 22*d*. Varied studies of Historic styles of Ornament, sufficiently extensive to represent the history of the styles selected, sketched from works in the South Kensington Museum, THE AUTHORITY IN EACH CASE BEING GIVEN. If they are from coloured ornament, the sketches are to be coloured also. Studies of figures without the architectural or ornamental surroundings with which they are combined are not desirable. (*See also* directions under Group II.) (On two imperial sheets.)

(*g.*) „ 23*d*. A design, drawn or painted, of Ornament and Human Figures as applied to decorative or Industrial Art. This design should be not less than 15 inches in its longest direction. It is essential that human figure should form an important feature of the ornament designed. (Of imperial size.)

and have passed "Good" or have obtained a first class at the Art Examinations in—

(*i.*) Anatomy of the Human Figure.
(*k.*) Historic Ornament.
(*l.*) Painting in colour a Group of still life (Subject 15*a* or 15*b*). Any medium or vehicle may be required in the regulations for the Examinations.
(*m.*) Drawing in chalk from the Life.
(*n.*) Design (Honours Stage).
(*o.*) Drawing the Antique from memory.

Candidates who are, or have been, students of the Royal Academy, and there admitted to study from the living model, are not required to pass the examination in drawing from the living model.

Certificate for Group IV.—(Modelling Ornament and the Figure.)

Fourth Group.

This Certificate is granted to candidates who have obtained the Art Class Teacher's or Intermediate Certificate, and who have submitted satisfactory specimens of the following works:—

(*a.*) Subject 8*b*². A shaded drawing of a complete figure from the Antique. (On an imperial sheet.)

This will not be required of a candidate who has taken the certificate for Group II.

(*b.*) Subject 18*b*. Modelled study of Ornament from the cast. (On a panel 18″ × 24″.)

(*c.*) „ 18*c*. Modelled study of Ornament from a drawing or photograph. (On a panel 18″ × 24″.)

(*d.*) „ 19*b*² and 19*k* (two works). A model of an Antique figure, not less than 30 inches high, in the round to be cast by the candidate, and another of like dimensions in relief.

(*e.*) „ 20. Flowers or Foliage, modelled suitably for sculptural treatment, and arranged ornamentally. (On a panel 18″ × 24″.)

(*f.*) „ 22*d*. A set of studies executed in Outline showing the treatment of Arabesques, &c., as in Group II. (On an imperial sheet.)

This will not be required of a candidate who has taken the certificate for Group II.

(*g.*) Subject 23*e*. Modelled ornament designed in similar character to that under 23*c* in Group II. (The four works arranged on a panel 18″ × 24″.)

and have passed "Good" or obtained a first class at the Art Examinations in—

(*h.*) Principles of Ornament (Elementary Stage).

This will not be required of a candidate who has taken the certificate for Groups I. or II.

(*i.*) Modelling, Design (Advanced Stage).

(*k.*) Modelling from the Antique.

Certificate for Group V.—(Modelling the Figure from Life.)

Fifth Group.

This Certificate is granted to candidates who have obtained a Certificate of the First and Fourth Groups, and who have submitted satisfactory specimens of the following works:—

(*a.*) Subject 19*e*. A Modelled study, not less than 30″ high, from the Life.

(*b.*) „ 8*c*². A shaded drawing of a complete figure from the Life. (On an imperial sheet.)

Candidates who have taken the certificate for Group III., and those who are, or have been, Students of the Royal Academy, and there admitted to study from the living model, are not required to pass the examination in drawing from the living model.

(*c.*) Subject 9*a*. A Drawing of the Skeleton placed within the outline of an Antique figure. (On an imperial sheet.)

This will not be required of a candidate who has taken the certificate for Group III.

(*d.*) Subject 9*c*. An Anatomical rendering of an Antique figure, Modelled. (On a panel not less than 30 inches high.)

This work accepted for Group V. Certificate will also count instead of the drawing of the muscles for Group III. Certificate.

(*e.*) Subject 22*d*. (*a.*) Drawings of the Relief Ornament of Historic styles drawn from the casts, carvings, metal work, &c. in the South Kensington Museum, WITH WRITTEN AUTHORITIES FOR EACH; and sufficiently extensive to represent the history of the various styles selected. (On two imperial sheets.) (*See also* p. 275, directions under Group II.)

(*b.*) A set of drawings, not less than 12 in number, showing the historic treatment of drapery in sculpture when the figure is treated decoratively. (On two imperial sheets.)

(*f.*) Subject 23*f*. A Modelled design in relief of Ornament and Figures as applied to decorative Art.

and have passed "Good" or obtained a first class at the Art Examinations in—

(*g.*) Anatomy.

(*h.*) Historic Ornament.

The subjects (*g*) and (*h*) will not be required of a student who has taken the certificate for Group III.

(*i.*) Modelling design (Honours Stage).

(*k.*) Modelling from life.

(*l.*) Drawing from the life.

Certificate for Group VI.—(Domestic Architectural Drawing.)

Sixth Group.

This Certificate is granted to candidates who have obtained a Certificate of the First Group, and who have submitted satisfactory specimens of the following works:—

(*a.*) Subject 1*e*. A sheet of exercises in Sciography. (On an imperial sheet.)

(*b.*) „ 23*a*. (1.) A sheet containing a Measured Drawing from a Building or Exterior Portion of a Building, with the Shadows accurately projected, and tinted. (On a sheet not exceeding 48 inches by 48 inches.)

(*c.*) „ 23*a*. (2.) A Measured drawing in Outline of an Interior Decorative detail, such as a tomb, a doorway, choir stall, or the like, in stone, wood, or metal. (On a sheet not exceeding 48 inches by 48 inches.)

and have passed "Good" or obtained a first class at the Art Examinations in—

(*d.*) Perspective (Advanced Stage).

(*e.*) Historic ornament.

(*f.*) Architectural design, based on a well-known example.

and obtain a pass in

(*g.*) The Elementary Stage of Science, Subject III., Building Construction. (This is substituted for former examination in Architectural construction.)

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THIRTY-SEVENTH ANNUAL REPORT

OF THE

BOARD OF SUPERINTENDENCE OF THE DUBLIN HOSPITALS.

TO HIS EXCELLENCY THE RIGHT HON. ROBERT OFFLEY ASHBURTON, BARON HOUGHTON,

Lord Lieutenant-General and General Governor of Ireland.

35, Dawson-street,
30*th May*, 1895.

MAY IT PLEASE YOUR EXCELLENCY :

We have the honour to lay before Your Excellency our Thirty-seventh annual Report on the condition and management of the City of Dublin Hospitals receiving Parliamentary Grants, and which were duly inspected by us during the year ended 31st March, 1895.

These are :—

1. Westmorland Lock Hospital.
2. The House of Industry Hospitals, viz. :—
   a. Hardwicke Fever Hospital.
   b. Whitworth Medical Hospital.
   c. Richmond Surgical Hospital.
3. Steevens's Hospital.
4. Meath Hospital and County Dublin Infirmary.
5. Cork-street Fever Hospital.
6. Rotunda Lying-in Hospital.
7. Coombe Lying-in Hospital.
8. St. Mark's Ophthalmic Hospital ; and
9. Royal Hospital for Incurables, which receives a portion of the Concordatum Fund.

As mentioned in former Reports, our inspections are made without any previous notification to the officials of the several Hospitals.

We inquired into the condition of each Institution, to ascertain if the buildings were in good order, the general management satisfactory, and if due provision were made for the comfort and welfare of the patients.

We observed in all these Hospitals a gradual improvement in the condition and surroundings of the patients, and as a rule a desire on the part of the authorities to give effect to the suggestions made by us in our visits.

The various Statistical and other Tables in Appendices will be found similar in character to those that have hitherto appeared

in regular annual sequence, but at the same time indicative of the relative changes and results in the operation of the different institutions.

The financial accounts are rendered on a uniform system, so that it can be seen in Appendix whether any Hospital is extravagant in its expenditure as compared with others.

We submit for comparison the following abstract statement of accounts for years ended 31st March, 1894, and 1895 :—

	1893–4.			1894–5.		
INCOME.	£	s.	d.	£	s.	d.
Government Grants,	15,722	15	9	15,722	15	9
Subscriptions and Donations,	5,026	16	6	5,511	16	2
Bequests,	1,779	13	11	7,531	2	3
Hospital Sunday Fund and Charity Sermons,	987	17	2	1,090	0	3
Income from Landed and other Property,	10,121	18	10	9,434	17	8
Assessments on the City and County of Dublin,	3,000	0	0	3,475	0	0
Pay Patients and Sundry other Receipts,	7,311	18	5	8,038	9	9
Total,	£43,951	0	7	£50.804	1	10
EXPENDITURE.						
Salaries of Officers,	4,840	11	0	4,873	2	1
Wages of Servants,	4,761	3	2	5,062	0	1
Rations of Officers and Servants,	4,150	0	11	4,057	16	10
Coals and Light,	3,458	6	6	3,369	12	1
Furniture and Repairs,	1,879	8	7	1,986	0	2
Buildings and Furnishing,	2,979	7	2	3,118	15	3
Stimulants,	903	18	3	937	7	1
Provisions and Groceries, Drugs, Surgical Appliances, and Clothing of Patients,	14,748	2	7	14,988	8	9
Sundry other Disbursements, as detailed,	5,117	0	10	8,837	19	9
Total,	£42,837	19	0	£47,231	2	1

The work accomplished during the period under consideration was as follows :—

The number admitted during the year was 10,302, making the whole number under treatment 11,075, of whom 9,868 left the wards either cured or relieved, or were discharged for other causes, and 531 died.

Eight hundred and eleven patients remained under treatment in these Hospitals on the 31st March, 1895.

Exclusive of incurables, the mortality was 4·81 per cent. on those treated to a termination.

The total daily average number of beds occupied in these Hospitals throughout the year was 812·14.

The time spent in Hospital by each patient under treatment (omitting the patients in the Royal Hospital for Incurables) averaged 20·76 days.

Appendix.—Table No. 1 shows a list of diseases of patients treated in the several Hospitals and the number that died of any particular disease during the year ended 31st March, 1895.

Table No. 2 shows the average cost per bed occupied throughout the year ended 31st March, in each Hospital, for maintenance and for establishment, and for both, exclusive of buildings and furniture.

Table No. 3 shows the several sources of income of each Hospital.

Table No. 4 sets forth in detail the chief heads of expenditure of each Hospital.

Table No. 5 gives the number of patients treated in each Hospital, the mortality per cent., the average daily number of beds occupied during the year, and the present extent of accommodation for each class of patients.

Table No. 6 shows the prices of articles supplied to each Hospital per contract or otherwise.

Table No. 7 gives the various dietaries in use in each Hospital.

Table No. 8 gives the names of the Governors of each Hospital, and number of attendances during the year.

The epidemic of small-pox which prevailed during the year subjected to a severe strain the resources of the Cork-street and the House of Industry Hospitals; but we are glad to report that in these two Institutions every provision was made at the commencement of the epidemic for the reception and treatment of the earliest cases of the malady.

Means had also been provided for thorough disinfection of all materials used, and the destruction of such clothing as might be deemed necessary.

Notwithstanding these strenuous efforts to prevent every fresh case from becoming a new focus of contagion, the disease extended to an alarming extent at the close of the year.

In connection with this subject, we recommend that a separate detached apartment should be erected in each Fever Hospital, where discharged patients could be thoroughly bathed, and put on their own disinfected clothing, previous to returning home.

We wish to remark that many cases of the disease occurring in the city were concealed, and not notified to the authorities, nor was the aid of a physician sought, so keen and anxious were the relatives to nurse their own sick, and to avoid their removal to Hospital.

Some doubts have been entertained as to the advisability of prohibiting without exception the visits of parents and immediate relatives to small-pox patients.

With regard to this arrangement we expressed our opinion in a former Report, and considered the prohibition of such visits harsh to the patients and their relatives, who often desire to see one another from motives of natural affection, and in respect to religious considerations, arrangements of little matters of property, dying wishes, &c., &c.

If it were generally known that a prohibition against the visits of relatives were rigorously enforced, many patients would not go to Hospital, and the result would be a greatly increased danger to the public; for contagion would extend more rapidly from the crowded homes of the poor to their neighbours, than from the sick in well ventilated wards to those who pay them short visits—with proper precautions.

The Westmorland Lock Hospital.

From all we have seen during our inspection we have come to the conclusion that the patients here are as well cared as the

structural defects of the Hospital will admit of. It has fairly met general requirements, and has been satisfactorily conducted in detail. Order, cleanliness, and discipline are strictly carried out. The supply of bedding and clothing is good and sufficient, and the patients' wants are carefully provided for. The meals are well cooked and served with punctuality.

The surgeons have resumed the prescribing of the diets giving the variety which the dietary as framed always afforded. This consists alternately of beef or mutton, roast or boiled, soup, fresh vegetables, and potatoes, also beef tea for patients on low diet.

The registrar orders the provisions according to the daily dietary book, which are received by the Matron, who vouches as to their quality and weight, and then issues them to the several departments for each day's consumption.

All clothing, nurses' and servants' uniforms, are cut out by the Matron, and made up by the patients under her supervision; these articles are marked with the Hospital stamp, and dated before distribution.

Stock books are strictly kept by the nurses and inspected by the Matron at regular intervals. The washing is satisfactorily done in the laundry, where there is an abundant supply of hot and cold water. The lavatories and bath rooms are fairly arranged, but are still capable of improvement.

There were 69 patients in this Institution on the 1st of April, 1894; 490 were admitted, and 17 infants were born in the house during the year; 493 were discharged; 11 died; and 72 remained on the 31st March, 1895.

The mortality was 2·18 per cent. on the total number treated to a termination.

The time spent in Hospital by each patient averaged 42·10 days, and the average daily number of beds occupied during the year was 66·44.

Steeven's Hospital.

We found this Hospital on inspection in a creditable condition of order and cleanliness. The Medical and Surgical wards had recently been painted and renovated.

The old fixed presses had been removed, and new presses for patients' clothing substituted. We observed that glass slabs on tables for surgical dressings, and metallic boxes for keeping antiseptic dressings are in use in the Surgical wards; also that a sterilizer embodying the most recent improvements is in use for antiseptic dressings.

We have ascertained that all infected articles of clothing are at present placed immediately in a receptacle containing a strong solution of carbolic acid.

The food was of good quality and well cooked, and everything that was seen gave evidence that the wants of the patients were carefully attended to, and that they were kindly treated.

The nursing staff under the present qualified and experienced Superintendent is efficient, and has much improved within the last few years.

The presses which contain the linen, and the Medical and Surgical appliances were found in order. The Staff Nurse of each ward is provided with a Stock Book in which is entered every article under her immediate charge, recording the date when each article was supplied, lost or broken.

The Superintendent of Nurses inspects and examines these books periodically, and affixes her initials at each inspection; the books being presented to the Board and checked by them every three months.

We found that the water-closets in connection with the Royal Irish Constabulary wards were in course of re-construction on the most approved principles, and the lavatories throughout the hospital in good order, with ample provision for emptying and rinsing ward utensils. We suggest the substitution of glass bed urinals for those of porcelain, at present in use, as the imperfection of the glazing of porcelain favours the deposition of organic matter and renders the vessel offensive and difficult to keep clean.

On a former occasion we commented unfavourably on the post-mortem room, and regret that on inspection it was found in the same unsatisfactory condition. It is used as a mortuary and for the performance of autopsies, an arrangement which is not in accordance with modern requirements. For obvious reasons the mortuary should be in an adjoining apartment, and appropriately arranged, so as to show respect to the feelings of the friends of the deceased patients.

Since our inspection we have been informed that the Governors had determined to construct a disinfecting chamber, a new mortuary, and a proper post-mortem room when funds should be available for that purpose.

The improvements in the fever house are to comprise separate wards for different fevers, and an observation ward.

Estimates have also been accepted for replacing the old canal water pipes, which were constantly bursting, by Vartry pipes, and to remodel on a new and economic plan the entire of the water supply system in the house.

On the 1st April, 1894, 116 patients remained in Hospital; 1,346 were admitted during the year; 1,288 were discharged; 65 died; and 109 remained on the 31st March, 1895.

The mortality was 4·80 per cent. on the total number treated to a termination.

The time spent in Hospital by each patient averaged 24·82 days, and the average daily number of beds occupied during the year was 99·43.

The Meath Hospital.

This hospital has been brought into a state of great efficiency of late years; it is equipped with a skilled nursing staff, and we have been informed that the night are as competent as the day nurses.

On the day of inspection the wards presented a cleanly and cheerful appearance, and the beds and bedding were properly looked after. We observed that the cards which were over each bed carefully noted the condition and progress of the patient.

We found all the various surgical appliances in perfect order, and ready for immediate use.

In the apothecary's department several improvements have been made, including a new stove and a patent enamelled earthenware sink, &c.

The greatest care continues to be exercised in keeping ready all apparatuses and antidotes for any emergency.

The Standing Committee have long felt that the accommodation in the medical department of the hospital was inadequate to meet the increasing demand on its resources; they have therefore determined to remedy this defect by building a new detached wing for the isolation of infectious diseases, having wards capable of containing 40 beds, with separate rooms for the nursing staff, The total cost of this building when complete and furnished will probably be £7,000.

The Medical Board have also erected a new Pathological and Bacteriological department, which, when completed, will be provided with every necessary requirement at a total cost of about £500.

We visited the culinary department and examined the various articles of food, including bread, beef, tea, milk, &c., which were found without exception of good quality; as far as we could judge the cooking was satisfactory, and no complaint was made to us as to the meals served in the wards.

We inspected the registry of patients and the account books, which appeared to be kept with care and accuracy, and the returns called for, from time to time, are made out and forwarded to this Board with promptitude.

There were 95 patients in this Hospital at the commencement of the year; 1,173 were admitted; 1,117 discharged; 67 died; and 84 remained on the 31st March, 1895.

The mortality was 5·65 per cent. on the total number treated to a termination.

The time spent in Hospital by each patient averaged 24·40 days, and the average daily number of beds occupied during the year was 84·75.

Cork-street Fever Hospital.

On the occasion of our visit to this Hospital we inquired closely into the various matters connected with its management. We were much gratified by the order, regularity, and cleanliness which prevail in the several departments.

The patients were carefully attended, the provisions were of good quality, and the kitchen accommodation and cooking utensils sufficient and in order.

In several of the wardsthe baths are stationary, an arrangement for general use we cannot quite approve of, as emanations from warm baths may be injurious to the rest of the patients in the ward.

Should a bath be necessary occasionally in a ward, a full-sized one on rollers ought to be on hand, which could be brought to the bedside, and used only in extreme cases. We are of opinion that bath-rooms suitably constructed apart from the wards would be advisable.

Owing to the prevalence of small-pox and the consequent need of separate accommodation for the nurses in attendance on that disease, the Managing Committee have erected a galvanised-iron house capable of accommodating sixteen nurses, with the necessary bath-room, trunk-room, lavatory, and kitchen.

New fire-places have been put up in the Recovery House, and doors open from the nurses' kitchen into the wards, so as to facilitate the nursing and supervision of the patients.

We were much pleased to observe the system of local telephones which has been recently erected in connection with all the wards and the porter's lodge, so as to facilitate answering the frequent inquiries of patients' friends at the gate.

We have been informed that owing to the increase of work an Assistant Matron has been appointed since September, and that the Managing Committee contemplate an addition to the laundry machinery with the view to economize labour.

At the commencement of the year 78 patients remained in the Hospital; 1,661 were admitted; 1,499 were discharged; 158 died; and 82 remained on the 31st March, 1895.

The mortality was 9·53 per cent. on those treated to a termination.

The average daily number of beds occupied was 101·98, and the time spent in Hospital by each patient averaged 21·40 days.

House of Industry Hospitals.

We examined the several departments of these Hospitals and found the wards and corridors scrupulously clean and in order. The patients' bedding was sufficient and in proper condition. The supply of linen was ample, and the laundry arrangements good. The nursing appears to be well carried out.

In addition to affording medical education to a large class of students, nurses are trained under the supervision of a highly qualified Superintendent, by which means this Institution renders a great service to the community at large. We consider that every Hospital should, as far as possible, afford facilities for the training of nurses, but the funds of such Institutions and the accommodation intended for patients should not be used for that purpose.

Since our last inspection new water-closets of the most approved pattern have been fitted up in the Whitworth Hospital.

All stores are now received and issued in a central store room which is sufficiently commodious and thoroughly ventilated. The larder has also been much improved.

For some years a project for the re-construction of the Richmond Hospital has been under consideration, and the Board of Governors only awaited the necessary funds to enter on the work. Dr. Gordon was able, by means of a charitable bequest entrusted to him, and with the sanction of the Master of the Rolls, to give a donation of £5,000 towards building a new Richmond Hospital. Mrs. Hamilton has also generously contributed a similar sum towards this undertaking.

We have learned with much satisfaction that the Governors have at a cost of £1,500 purchased a considerable area of most objectionable and insanitary grounds and buildings, in the vicinity of these Hospitals, which will lead in a few months to the removal of a number of cow yards which have been a nuisance in the district, and ought never to have been allowed within the city bounds. The general sanitary condition of the entire district will be benefited by these improvements.

At the outbreak of the present epidemic of small-pox, the Governors had the Auxiliary Hospital ready for the emergency, and were at once able to place it and an efficient staff of nurses at the disposal of the sanitary authorities. As the epidemic increased it was found necessary to apply for additional accommodation, and the Board of Governors promptly met the new demand, and placed at the disposal of the Authorities the whole of the Hardwicke Hospital for the reception and treatment of small-pox patients. The strictest rules are in force for the complete segregation of patients, nurses, and servants. Whenever opportunity offers the wards are thoroughly disinfected.

It was reported to us that a child named Edward Wren died of small-pox on the 16th of July, and that the body had remained unburied for the space of three days in the mortuary of the Hospital. As the danger of contagion emanating from such bodies is very great we addressed a communication to the Governors on this subject, and have been informed in reply that the delay in the speedy interment of this body was caused in consequence of the difficulty in obtaining all particulars required by the Cemeteries Committee's Office.

We have been assured that the Governors use their best efforts to prevent the spread of contagion, and that in the event of a patient dying of small-pox, directions have been issued to have the body disinfected and placed in a coffin, and interred with as little delay as possible.

The accounts in connection with the Hospitals are examined each month by the Governors, and an analysis of same, showing the average number of patients, nurses, and servants, and the average cost of these per day and month; also comparison with the corresponding month of previous year is submitted to them, which enables them to check any undue increase in expenditure, as well as showing the head under which the increase has arisen. The result of this careful supervision has been a marked increase in the efficiency of the Hospitals, the dietary of the patients being very good, and their comfort furthered in every respect.

Hardwicke Fever Hospital.

Twenty-three patients remained in the Hospital on the 1st of April, 1894; 784 were admitted during the year; 731 were discharged; 58 died; giving a mortality of 7·35 per cent. on the total number of cases treated to a termination.

The average daily number of beds occupied during the year was 42·62, and the time spent in Hospital by each patient averaged 17·04 days.

Whitworth Medical Hospital.

On the 1st of April, 1894, 34 patients remained in Hospital; 627 were admitted; 558 were discharged; 55 died; giving a mortality of 8·97 per cent. on the total number of cases treated to a termination.

The average daily number of beds occupied throughout the year was 36·54; and the time spent in Hospital by each patient under treatment averaged 19·65 days.

Richmond Surgical Hospital.

There were 54 patients in this Hospital when the year commenced; 693 were admitted; 666 were discharged; 26 died; giving a mortality of 3·75 per cent. on 692 cases treated to a termination.

The average daily number of beds occupied in the year was 52·98; and the time spent in Hospital by each patient averaged 21·81 days.

Rotunda Lying-in Hospital.

The gentlemen constituting the Board of Governors of this Hospital appear to be unsparing of time and trouble in their efforts to make the Institution a real boon to the patients for whom it is designed.

Its high educational reputation is fully maintained under the management of the present Master. We found every department of the Hospital in good order, and supplied with the most modern improvements.

The patients receive every necessary care and attention, and the several articles of food which we examined were of good quality.

Considering the large class of students and nurses who attend the Hospital, we feel it cannot be too forcibly impressed on them that it is their imperative duty to take the most stringent precautions against the danger of their becoming the means of disseminating contagion.

We were glad, however, to see that the strictest antiseptic precautions continue to be adopted for the safety of patients. Pupils are required before examining any patient to thoroughly wash and disinfect their hands.

The walls of the apartment in which labour is conducted are formed of a hard non-absorbent substance, and the flooring is laid with concrete, so that the entire apartment may be washed and disinfected when necessary.

As the new wing on the west side is at present in process of construction, we cannot report on it as fully as we could wish; but we are informed that it will afford the necessary accommodation urgently needed in connection with the Lying-in Hospital, and also provide a separate building for the treatment of the diseases of Woman in lieu of the existing auxiliary Hospital, which is totally unsuitable for the purpose.

Although the expenditure of the Hospital is considerable, it is gratifying to find that the income has increased.

The nursing, which formerly was a source of expense, now produces a considerable revenue; and it is a matter of special gratification that the Corporation grant has been restored.

On the 1st of April, 1895, there were 36 patients in the labour wards; 1,538 were admitted during the year; 1,239 were discharged after delivery; 300 were discharged, not having been delivered; 6 died; and 29 remained in Hospital at the end of the year.

Twenty-two patients remained in the auxiliary or chronic department on the 1st of April, 1894; 420 were admitted; 396 discharged; 18 died in the year ended 31st March, 1895; and 28 then remained.

The average daily number of beds occupied throughout the year by labour cases was 32·60, and that of the chronic class 27·62.

The time spent in Hospital by labour cases averaged 7·56 days, and that by the chronic class 22·81 days.

The mortality of the labour patients, deducting non-parturient cases, was 0·48 per cent., and that of the chronic class 4·34 per cent.

Coombe Lying-in Hospital.

We are able to report that the management of this Hospital under the present Master, Dr. F. Kidd, has made great progress during the last year.

It continues to give valuable assistance to Lying-in women in this poor district which is greatly needed, and it affords considerable advantages in forwarding medical education.

We were well satisfied with the whole interior of the Hospital, and consider that its condition is very creditable to the Governing Body.

The wards are bright, clean, and well ventilated, and the floors all through the Maternity department have been stained, and kept polished with bees' wax and turpentine.

The walls in the Labour and Convalescent wards and corridors have been oil painted. Lock up presses have been provided for "poisonous" solutions, such as corrosive sublimate and carbolic acid, the key being kept by the Sister in charge of the ward.

All labour patients are now confined in a special ward, and transferred a few hours afterwards on a carriage with rubber tyres to convalescent wards. After the discharge of one set of labour patients, the contents of the ward, including bedsteads and wire mattresses, are thoroughly washed with turpentine and carbolic acid solution, and the ward is afterwards purified by sulphur fumigation for twenty-four hours.

We have ascertained that all soiled linen is promptly removed from the wards and placed in an outhouse quite separate from the Hospital buildings.

We observed notices conspicuously placed in each ward, drawing the attention of the nurses and students to the necessity of taking antiseptic precautions, and giving details how these should be carried out.

We have been informed that the nursing staff is efficient, and perform their duty with intelligence and fidelity, and due attention is given to those cases requiring assistance during the night.

We observed that the objectionable practice, contrary to our repeated recommendations, of storing in the basement the straw used for patients' bedding is still persevered in.

The danger from fire of straw stored immediately under the wards of the Lying-in Department must be obvious to any one.

Thirteen labour patients remained in Hospital on the 1st of April, 1894; 499 were admitted during the year; 495 were discharged; 96 were discharged, not having been delivered; 4 died; and 13 remained at the close of the year.

Eight patients remained in the chronic wards on the 1st of April, 1894; 263 were admitted; 251 discharged; 4 died; and 16 remained at the close of the year. The average daily number of beds occupied throughout the year by labour cases was 11·30, and by chronic cases 12·57.

The time spent in Hospital by labour patients averaged 8·05 days, and that by the chronic class 16·93 days.

The mortality of patients admitted to the labour wards, deducting 96 that were discharged, not having been delivered, was 4 deaths in 403 cases, or 0·99 per cent., and for the chronic class 4 died, giving a mortality of 1·56 per cent.

The Royal Hospital for Incurables.

On inspecting this Hospital it presented its usual appearance of being kept in most creditable order; it continues to enjoy the confidence of all ranks and classes, and receives a large support from the public.

Everything that human skill and kindness can effect is provided to alleviate the sufferings of the patients.

The additions and improvements carried out in the last few years are very considerable and greatly add to the efficiency of the Hospital.

Since our last inspection, the new pavilion containing two wards has been opened. In the decoration of these wards a different shade of green has been selected for the wood-work, and a pleasing contrast has been effected between them and the other wards.

A steam boiler has also been erected for heating these wards, lavatories, and baths, which will add much to the comfort of the patients.

The special gearing adopted for opening and closing the windows is easily worked, simple and not likely to get out of repair. This arrangement is said to be an improvement on the ordinary double sashes, which are often troublesome to manage, owing to the sash lines knotting, breaking, or otherwise getting out of order.

The Hospital is now capable of accommodating 220 patients.

One hundred and eighty patients remained in Hospital on the 1st of April, 1894; 91 cases were admitted; 2 resigned; 59 died during the year; and 210 remained on the 31st March, 1895.

The mortality was 96·72 per cent. on the total number of cases treated to a termination.

The time spent in Hospital by each case averaged 266·22 days.

The average daily number of beds occupied throughout the year was 197·66.

St. Mark's Ophthalmic Hospital.

We have frequently commented on the structural defects of the basement, and the inadequate accommodation for servants. We have also adverted to the out patients' department as not being sufficiently spacious or well ventilated for the large number of patients who attend.

Considering that improved accommodation is so imperatively necessary to efficiently carry on the service of the Hospital, we hope that its amalgamation with the National Eye and Ear Infirmary will soon be effected. This amalgamation is said to be in progress.

On the 1st of April, 1894, 45 patients were in Hospital; 700 were admitted during the year; 698 were discharged; and then 47 remained.

The average daily number of beds occupied in Hospital was 45·65, and the time spent in Hospital by each patient averaged 22·36 days.

POWERSCOURT, *Chairman.*
FRANCIS W. BRADY, Bart.
ARDILAUN.
GEORGE H. PORTER, Bart.
SAMUEL GORDON, M.D.
JOHN E. BARRY.
JOSEPH WOODLOCK.
PERCY R. GRACE, Bart.
JOHN BANKS, K.C.B.
LAMBERT H. ORMSBY, M.D.
CHARLES E. LAMBKIN.
THOMAS A. DICKSON, P.C.

WILLIAM J. MARTIN, *Secretary.*

APPENDIX.

Appendix.
No. 1.

TABLE No. 1.

A CLASSIFIED RETURN of the DISEASES of Patients treated in the HARDWICKE FEVER, WHITWORTH MEDICAL, and RICHMOND SURGICAL HOSPITALS; of the number of such Patients affected with, and of the number that died of, any particular Disease during the Year ended 31st March, 1895, as compiled by Dr. SAMUEL MATHEWS, Resident Physician.

HOUSE OF INDUSTRY GOVERNMENT HOSPITALS.

Hardwicke Fever Hospital.

THE HARDWICKE FEVER HOSPITAL.

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Alcoholism,	3	–	Jaundice,	1	–
Bronchitis, Acute,	3	–			
			Meningitis,	1	–
			Minders,	4	–
Cellulitis,	2	–			
Croup,	1	–			
			Nephritis,	1	–
Debility,	1	–	Oedema of Leg,	1	–
Dementia,	1	–			
Diarrhœa,	3	–			
Diphtheria,	1	–	Pleuritis,	1	–
			Pneumonia,	16	2
			Psoriasis,	1	–
			Phthisis,	3	–
Eczema,	1	–			
Epilepsy,	1	1			
Erysipelas,	30	2			
Erythema,	1	–	Rheumatism, acute,	3	–
			Rotheln,	1	–
Fever,	37	–			
„ Typhus,	5	–	Scarlatina,	107	3
„ Typhoid,	63	5	Syphilis,	3	–
„ Measles,	9	–			
			Tonsillitis,	6	
Gonorrhœa,	2	–	Tuberculosis,	1	1
Heart, Disease of,	1	–	Varicella,	11	–
			Variola,	455	44
Inflammation, of Cornea,	1	–			
Influenza,	1	–	Whooping Cough,	1	–

Appendix

No. 1.

Whitworth Medical Hospital.

WHITWORTH MEDICAL HOSPITAL.

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Abscess,	1	–	Icthyma,	1	–
Acne,	2	–	Icterus,	1	–
Ague,	1	–	Influenza,	37	5
Albuminuria,	2	–	Intestinal Obstruction,	1	–
Alcoholism,	9	–	Jaundice,	2	–
Anæmia,	6	–			
Aneurism, of Aorta,	1	–	Lead Poisoning,	1	–
Aortic Patency,	1	–	Locomotor Ataxia,	1	–
Aortitis,	1	–	Lumbago,	1	–
Aphasia,	1	–	Lymphadenoma Elephantiasis.	1	–
Arachnitis,	1	–			
Arthritis,	2	–	Minders,	4	–
Ascites,	5	–	Melancholia,	1	–
Asphyxia,	2	–	Mitral Regurgitation,	6	–
Asthenia,	2	1	Molluscum Contagiosum,	1	–
Asthma,	7	–			
			Nephritis,	12	4
Bright's Disease,	29	2	Nervous Tremors,	1	–
Bronchitis, Acute,	49	–	Neuritis,	3	–
Cancer of Liver,	1	1	Obesity,	2	–
,, Stomach,	1	1	Oedema,	2	–
Catarrh,	1	–	Ophthalmia,	1	
Cellulitis,	2	–	Palsy,	3	–
Chlorosis,	2	–	Paralysis,	6	1
Chorea,	2	–	Paraplegia,	3	–
Cirrhosis of Liver,	7	1	Pediculi,	1	–
Constipation,	14	–	Peritonitis,	2	–
Convulsions,	1	1	Pleuritis,	10	1
Cystitis,	1	–	Pleural Effusion,	1	–
Debility,	22	–	Plumbism,	1	–
Delirium Tremens,	4	–	Pneumonia,	23	11
Dementia,	1	–	Prostatitis,	1	–
Diabetes,	3	1	Psoriasis,	5	–
Diphtheria,	1	–	Phthisis,	48	11
Dropsy,	3	–	Purpura,	1	–
Dyspepsia,	2	–	Pylitis,	1	–
Ecthyma,	1	–	Rheumatism, Acute,	24	–
Eczema,	3	–	,, Chronic,	6	–
Empyema,	5	–	Rupture of Aorta,	1	1
Endocarditis,	3	1	Scabies,	1	–
Epilepsy,	2	–	Sciatica,	8	–
Erysipelas,	7	–	Scarlatina,	21	–
			Sclerotitis,	1	–
Fever,	7	–	Sarcoma,	1	
,, Rheumatic,	5	–	Scurvy,	1	–
,, Typhoid,	26	–	Synovitis,	1	–
,, Measles,	1	–	Syphilis, Primary,	4	–
Fits,	1	–	,, Secondary,	3	–
Gastritis,	15	1	Tonsillitis,	9	–
Glands, Enlarged,	2	–	Tumour,	1	–
Gout,	4	–	Tubercular Laryngitis,	3	–
			Tuberculosis,	1	1
Hæmatemesis,	1	–	Ulcers,	3	–
Hæmaturia,	2	–	,, Gastric,	5	–
Hæmorrhoids,	2	–	Uraemia,	1	1
Heart, Disease of,	47	9	Urticaria,	1	–
Hemiplegia,	7	–			
Herpes Zoster,	3	–	Varicella,	7	–
Hernia,	1	–	Variola,	2	–
Hypochondriasis,	1	–	Vertigo,	1	–
Hysteria,	1	–	Whooping Cough,	1	–

Appendix.

No. 1.

Richmond Surgical Hospital.

RICHMOND SURGICAL HOSPITAL.

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Abscess,	30	5	Depressed Nasal Bone,	1	–
,, in Axilla,	1	–	Delirium Tremens,	3	–
,, Psoas,	1	–	Destruction of Pharynx,	1	1
,, in Ear,	1	–	Dislocation,	3	–
,, Brodies,	1	–	Drop Wrist,	1	–
,, Lumbar,	1	–			
,, Ischio-rectal,	1	–			
,, in Perineum,	1	–			
,, Perityphlitis,	1	1	Ectropium,	2	–
,, Pectoral,	1	–	Eczema,	1	–
,, Thoracic,	1	–	Empyema,	2	1
,, Perineal,	1	–	Entropium,	4	–
,, Peri-rectal,	4	–	Epistaxis,	1	–
Acne,	1	–	Erysipelas,	2	1
Adenoma of Neck,	1	1	Exophthalmia,	6	–
Adenoids, Post-nasal,	10	–			
Ague,	1	–			
Alcoholism,	22	–			
Amyloid,	1	–			
Aneurism of Aorta,	1	–	Fistula, in Ano,	5	–
Angular Curvature of Spine,	1	–	,, Perineum,	1	–
Anthrax,	1	–	Faecal Obstruction,	2	–
Ankylosis of Elbow-joint,	6	–	Fracture, Elbow-joint,	5	–
Arthritis,	2	–	,, Leg,	7	–
Ascitis,	1	–	,, Skull,	3	2
			,, Tibia,	20	–
			,, Spine,	1	–
			,, Fibula,	12	–
Bladder Trouble,	2	–	,, Radius,	1	–
Bruises,	3	–	,, Ulna,	4	–
Bruised Foot,	4	–	,, Patella,	1	–
Bubo,	11	–	,, Clavicle,	1	–
Bulimia,	1	–	,, Os Calcis,	1	–
Burns and Scalds,	13	7	,, Ribs,	2	–
Bursitis,	4	–	,, Humerus,	1	–
			,, Jaw,	3	–
			,, Potts',	2	–
			,, Femur,	9	–
Calculus, in Bladder,	4	–			
Cancer of Penis,	1	–			
,, Gland,	1	–			
,, Jaw,	4	–			
,, Stomach,	2	–	Gangrene,	6	–
,, Prostate,	1	1	Ganglion,	4	–
,, Breast,	3	–	Gastritis,	1	–
,, Rectum,	1	–	Glands, Enlarged,	18	–
,, Lip,	2	–	Goitre,	2	–
,, Larynx,	1	–	Gonorrhœa,	2	–
,, Mouth,	1	–	Gunshot in Eye,	1	–
Caries of Spine,	7	–			
Cataract,	3	–			
Cellulitis,	1	–			
Club Feet,	3	–			
Concussion of Brain,	1	–	Hæmatocle,	2	–
Constipation,	3	–	Hæmaturia,	1	–
Contusion,	1	–	Hæmorrhage,	1	–
Convulsions,	2	–	Hæmorrhoids,	4	–
Crushed Fingers,	2	–	Hare Lip,	5	–
Cuts,	6	–	Hernia,	31	–
Curvature of Spine,	3	–	Hydrocele,	4	–
Cyst on Neck,	2	–	Hypochondriasis,	1	–
Cystitis,	6	–	Hysteria,	3	–

Continued.

Appendix.

No. 1.

Richmond Surgical Hospital.

RICHMOND SURGICAL HOSPITAL—*continued.*

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Impaction of Bowels,	1	–	Rickets,	6	–
Intestinal Obstruction	2	–			
Ingrowing Toe-nail,	2	–			
Injury to Spine,	2	–			
Iritis,	2	–			
			Scirrhus	1	–
			Sclerotitis,	1	–
			Shock,	2	
			Sinus,	9	–
Kidney (Floating),	2	–	Skin Scleroderma,	1	–
			Sore on Thumb,	1	–
			Splenitis,	2	–
			Sprain,	8	
			Spine, Dislocation of	1	–
Laryngitis,	2	–			
Lardaceous,	1	1			
Leg blown off,	1	–			
Leg Inflamed,	1	–			
Lipoma Testis,	1		Stricture of the Œsophagus,	14	2
Lupus,	4	–	,, Urethra,	2	–
Lymphadenoma,	2	–	Strumous Glands,	1	–
Lymphangitis Sub-Lingual	1	–	Synovitis,	11	–
			Syphilis, Primary,	24	–
			,, Secondary,	3	–
			,, Tertiary,	1	–
			Syphilitic Knee,	2	–
Malingering,	1	–	Swelling on Legs,	1	–
Meningitis Tubercular,	1	–	Swallowed Tack,	1	–
Minders,	5	–			
Morbus Coxæ,	14	–			
Molluscum Dermatolyticum	1	–			
			Talipes, Valgus,	6	–
			,, Varus,	4	–
			Tetanus,	1	1
Nævus,	4	–	Thyroid, Enlarged,	1	–
Necrosis,	16	–	Tonsillitis,	2	–
Neuralgia,	1	–	Tumour,	13	1
			,, Abdominal,	1	–
			Tuberculosis of Ankle,	5	1
			,, Elbow,	2	–
			,, Tarsus,	1	–
Orchitis,	1	–	,, Knee,	4	–
Osteo-Sarcoma,	1	–	Tubercular Knee,	24	–
Otitis,	2	–			
Ovaritis,	1	–			
			Ulcers,	25	–
Palate, Cleft,	2	–	Urine, retention of,	1	–
Papilloma on Chin,	2	–	Uterus,	1	–
Paralysis,	5	–	Uterine Fibroids,	1	–
Paraplegia,	2	–			
Periostitis,	4	–			
Phimosis,	4	–			
Phlebitis,	2	–			
Poisoning,	1	–	Varicose Veins,	19	–
Polypus nasi,	1	–	Varicocele,	4	–
,, uteri,	1	–			
Prepuce Sloughing,	1	–			
Prolapsus uteri,	1	–			
Pruritis ani,	1	–	Wound,	2	–

MEATH HOSPITAL, Year ended 31st March, 1895.

Disease.	No. Treated.	No. Died.	Disease.	No Treated.	No. Died.
Abscess, Acute,	24	–	Coma,	2	–
,, Chronic,	10	3	Concussion of Brain,	9	–
,, Renal,	1	–	,, Spine,	1	–
,, Mammary,	5	–	Conjunctivitis,	2	–
Acne,	2	–	Constipation,	9	–
Ague,	1	–	Contraction of Thumb,	1	–
Alcoholism,	8	1	Contusion,	11	–
Amenorrhœa,	3	–	Convulsions,	3	–
Anasarca,	1	–	Cramps,	3	–
Anæmia,	3	–	Croup, Membranous,	2	–
,, Pernicious,	2	–	Cyst Dermoid,	1	–
Aneurism of Aorta,	2	–	Cystitis,	2	1
Angina Pectoris,	1	–	Delirium tremens,	2	–
Anthrax,	7	1	Debility,	14	1
Ankylosis of Elbow,	1	–	Diabetes Mellitus,	4	1
,, Knee,	2	–	Diarrhœa,	4	–
Anus, Fistula in,	4	–	Diphtheria,	1	–
Aortic Patency,	7	1	Dropsy,	4	–
Aphonia,	1	–	Dyspepsia,	9	–
Aphthæ,	1	–	Dysuria,	3	–
Apoplexy,	9	5	Eczema,	6	–
Arthritis,	1	–	Empyema,	1	–
Ascarides,	2	–	Emphysema,	4	–
Ascites,	7	–	Enteritis,	1	–
Asthma,	4	–	Epilepsy,	4	–
Ballinitis,	1	–	Epistaxis,	3	–
Bronchitis, Acute (Broncho-Pneumonia).	12	2	Epulis,	2	–
			Erysipelas,	5	–
Bronchitis, Chronic,	17	5	Erythema,	1	–
Bronchocele, Cystic,	1	–	Exostosis,	3	–
Bubo,	3	–	Fever, Enteric,	58	6
Burns and Scalds,	17	2	,, Typhus,	2	–
Bursitis, Acute,	4	–	,, Measles,	1	–
Calculus, in Urethra,	2		,, Scarlatina,	7	–
,, Bladder,	1	–	,, Rötheln,	1	
Cancer, of Breast,	6	–	,, Variola,	5	–
,, Hand,	1	–	Fracture of Clavicle,	2	–
,, Lower Jaw,	1	–	,, Femur,	10	–
,, Lips,	4	–	,, Fibula,	17	–
,, Neck,	1	–	,, Humerus,	4	–
,, Stomach,	3	–	,, Olecranon,	2	–
,, Intestines,	2	1	,, Patella,	1	–
,, Liver,	2	–	,, Radius,	4	–
,, Œsophagus,	2	–	,, Ribs,	2	–
,, Tongue,	2	–	,, Skull,	3	–
Cardialgia,	1	–	,, Tibia,	7	–
Caries, of Foot,	4	–	,, Tibia and Fibula, combined.	12	–
,, Hand,	3	–			
,, Spine,	3	–	,, Inferior Maxilla,	2	–
,, Head of Tibia,	2	–	,, Superior Maxilla,	1	–
Catarrh,	11	–	,, Spine,	2	1
Cellulitis,	3	–	Furuncle,	1	–
Cephalalagia,	2	–	Gangrene, of Foot,	1	–
Chancre,	3	–	Ganglion,	1	–
Chemosis,	1	–	Gastritis and Gastric Ulcer,	8	1
Chlorosis,	27	–	Gastro enteritis,	1	–
Chondroma,	2	–	Genu Valgum,	1	–
Chorea,	7	–	Genu Varum,	2	–
Cirrhosis, of Liver,	6	–	Gleet,	2	–
,, Lungs,	1	–	Gonorrhœa,	4	–
Cleft Palate,	2	–	Gout,	5	–
Colic,	1	–	Graves's Disease,	1	–
,, Biliary,	1	–	Hæmatemesis,	3	–
Colica Pictonum,	2	–	Hæmoptysis,	2	–

Appendix.

No. 1.

Meath Hospital.

MEATH HOSPITAL—*continued.*

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Hæmorrhoids,	5	–	Pertussis,	2	–
Hare Lip,	2	–	Phimosis,	3	–
Heart, Disease of,	4	2	Phlebitis,	9	–
Hemiplegia,	2	–	Phlegmasia dolens,	2	–
Hepatitis, Suppurative,	1	1	Phthisis pulmonalis,	53	5
Herpes, Zoster,	3	–	,, Laryngea,		
Hydrocele,	2	–	Pleuritis,	9	–
Hydrosarcocele,	1	–	Pleurodynia	4	–
Hydrophobia,	1	1	Pleuropneumonia,	4	1
Hypochondriasis,	1	–	Pneumonia,	23	4
Hysteria,	2	–	Poisoning by Mercury (Corrosive Sublimate).	1	–
Icterus,	4	–			
Intestinal Obstruction,	3	–	Poisoning, Acute, by Lead,	1	–
Influenza,	29	–	Polypus nasi,	1	–
Laryngitis,	3	–	,, ani,	1	–
Lateral Sclerosis,	2	–	Prolapsus ani,	2	–
Leucocythæmia,	2	1	Prostate, enlarged,	3	–
Lipoma Testis,	1	–	Prostatitis, Chronic,	2	–
Lumbago,	3	–	Psoriasis,	4	–
Lupus, of Nose,	2	–	Purpura,	1	–
Lymphangitis,	3	–	Ranula,	1	–
Lymphoma (Tubercular)	11	–	Rectum, Cancer,	2	–
Locomotor Ataxy,	2	1	Rheumatism, Acute,	37	–
Luxation (Hay's),	2	–	,, Chronic, Subacute.	23	–
,, of Humerus,	1	–			
,, compound—Ankle,	1	1	Ruptured Intestine,	1	1
,, of Clavicle,	2	–	Sarcocele, Syphilitic,	2	–
Mammary Abscess,	3	–	,, Malignant,	2	–
Mania, Suicidal,	3	–	,, Tubercular,	2	–
Marasmus,	1	–	Sciatica,	7	–
Mastoid Disease,	1	–	Sarcoma, Breast,	1	–
Meningitis, Tubercular,	4	4	Scrofula and Struma,	9	–
Mitral Valve, Disease of,	21	4	Septicæmia,	1	1
Molluscum,	2	–	Sprain of Foot (ankle)	14	–
Morbus Coxæ,	6	–	Spine, Sprain,	1	–
Multiple Nuritis,	3	1	,, Displacement of Cervical Vertebræ.	2	–
Myxodæma,	1	–			
Necrosis of Femur,	2	–	Stricture of the Œsophagus,	1	–
,, Inf. Maxilla,	2	–	,, Urethra,	7	–
,, Tibia,	1	–	Sycosis menti,	2	–
Nephritis,	17	2	Synovitis, Acute Traumatic,	14	–
Neuralgia,	2	–	,, Tubercular,	5	–
Neuroma,	1	–	,, Fever,	2	–
Ophthalmia Strumous,	1	–	Syphilis, Primary,	1	–
Onychia,	2	–	Talipes, Varus,	2	–
Onyxis,	3	–	Tænia solium,	3	–
Orchitis,	4	–	Tetanus,	1	1
Osteo-Sarcoma,	2	–	Tonsillitis,	18	–
Osteitis,	3	–	,, Suppurative,	5	–
Otitis,	1	–	Tinea Tonsurans,	1	–
Otorrhœa,	3	–	Tumour, Ovarian Cysts,	3	–
Palpitatio Cordis,	1	–	,, Uterine,	1	–
Paralysis, General Insane,	3	–	,, Renal,	1	–
,, Face (Bell's),	1	–	,, Leg,	1	–
Paraphymosis,	1	–	Ulcers,	27	–
Paraplegia,	1	–	Urine, Retention of,	7	–
Paronychia,	5	–	,, Incontinence of,	1	–
Parulis,	1	–	,, Infiltration of, from Ruptured Urethra.	2	–
Pemphigus,	2	–			
Pericarditis,	2	–	Urticaria,	1	–
Periostitis,	3	–	Varix,	23	–
Peritonitis (Tubercular 1, ,, and Septic 2)	3	3	Varicocele,	2	
			Wounds,	39	–
Perityphlitis,	1	–			

STEEVENS'S HOSPITAL, Year ended 31st March, 1895.

Disease.	No. Treated	No. Died.	Disease.	No. Treated.	No. Died.
Abortion,	6	–	Fever, Typhoid,	26	2
Abscess,	54	2	Fistula in Ano,	4	–
Alcoholism,	2	–	Fracture of Leg,	27	2
Amputations,	5	1	,, Clavicle,	4	–
Asthenia,	8	1	,, Forearm,	11	–
Acne,	2	–	,, Tibia,	2	–
Albuminuria,	7	–	,, Thumb,	1	–
Amenorrhœa,	2	–	,, Femur,	11	–
Anæmia,	16	2	,, Rib,	6	2
Anthrax,	4	–	,, Scapula,	3	2
Apoplexy,	1	1	,, Nasal Bones,	1	–
Arthritis,	1	–	,, Humerus,	1	–
Asthma,	1	–	,, Toe,	2	–
Bronchitis, Acute,	48	2	Goitres,	1	–
,, Chronic,	7	3	Gastritis,	17	–
Bubo,	9	–	Gonorrhœa,	10	–
Burns and Scalds,	11	2			
			Hæmoptysis,	3	–
Bursitis,	1	–	Hæmorrhage of,	2	1
			Hernia,	4	–
			Hæmorrhoids,	3	–
Cancer of Breast,	1	1	Hare Lip,	2	–
,, Lip,	1	–	Heart, Disease of,	19	4
,, Cheek,	1	–	Hepatitis,	1	–
,, Penis,	1	–	Hernes,	1	–
Catarrh,	74	–	Hydrocele,	1	–
Chancre,	10	–	Hysteria,	4	–
Chorea,	3	–			
Cirrhosis of Liver,	1	1			
Colic,	1	–	Influenza,	60	–
Concussion of Brain,	10	–	Iritis,	3	–
Condyloma,	1	–			
Conjunctivitis,	12	–			
Constipation,	12	1	Killosis,	3	–
Contusion,	3	–			
Convulsions,	3	–			
Cramps,	4	–	Laryngitis,	9	–
Cystitis,	3	–	Leucoma,	1	–
			Lumbago,	1	–
			Lupus,	4	–
Delirium Tremens,	10	2	Luxation of Foot,	2	–
Diabetes,	1	–	,, Shoulder,	4	–
Diarrhœa,	2	–			
Dropsy,	3	–			
Dyspepsia,	7	–	Mania,	1	–
			Morbus Coxæ,	2	–
			Menorrhagia,	2	–
Eczema,	12	–	Metritis,	1	–
Empyema,	5	1			
Enteritis,	1	–			
Epilepsy,	4	–	Necrosis,	11	–
Epistaxis,	3	–	Nephritis,	5	3
Erysipelas,	23	2	Neuralgia,	8	–
Erythema,	4	–	Neuroma,	2	–
Epididymitis,	2	–			
			Onychia,	5	–
Fever, Enteric,	20	2	Orchitis,	5	–
,, Simple continued,	2	–	Otorrhœa,	1	–

(continued.

Appendix.

No. 1.

Steevens's Hospital.

STEEVENS'S HOSPITAL—*continued.*

Disease	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Paralysis,	2	–	Spine, Curvature of,	4	–
Paraphymosis,	2	–	,, Caries of,	1	–
Parulis	1		Stricture of Urethra,	8	–
Periostitis,	2	–	Sycosis,	2	–
Peritonitis,	5	3	Synovitis,	6	–
Phrenitis,	1	1	Syphilis, Primary,	14	–
Phthisis pulmonalis,	39	11	,, Secondary,	10	–
Pleuritis,	5	–	,, Tertiary,	1	–
Pleurodynia,	2	–			
Pneumonia,	22	5			
Psoriasis,	1	–	Talipes,	1	–
Pharyngitis,	10	–	Tonsillitis,	71	–
Pyæmia,	3	3	Tumour,	6	–
			Tuberculosis Ankle,	1	–
Rachitis,	1	–			
Ranula,	1	–	Uterus,	1	–
Rheumatism, Acute,	101	–			
,, Chronic,	2	–			
			Variola,	1	–
			Varix,	22	–
Sciatica,	3	–			
Scarlatina,	61	2			
Sprain,	26	–	Wounds,	132	–

Rotunda Lying-in Hospital.

THE LYING-IN (ROTUNDA) HOSPITAL.

RETURN of DISEASES treated in GYNÆCOLOGICAL (AUXILIARY) WARDS during year ended 31st March, 1895.

Contracted Pelvis,	4	–	Lacerated Cervix,	5	–
Constipation,	8	–	,, Perinaeum,	17	–
Cystitis,	5	–	,, Uretha,	1	–
Debility,	7	–			
			Malignant Disease,	31	–
			Malpositions of Uterus,	82	–
Ectopic Gestation,	4	–	Mania	1	–
Endometritis,	110	–	Mastitis,	3	–
			Morbus Coxae,	1	–
			Myoma,	20	–
Fevers,	1	–			
Fistulae,	6				
			Ovarian Tumours,	33	–
Haematoma of Vulva,	1	–			
Hæmorrhoids,	4	–	Parametritis,	4	–
Hernia,	2	–	Phlegmasia,	1	–
			Pleurisy,	1	–
			Pregnancies,	15	–
			Polypi uteri,	3	–
Incomplete Abortion,	12	–	Pyosalpynx,	24	–

continued.

ROTUNDA LYING-IN HOSPITAL—*continued.*

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Renal Disease,	1	–	Urethral Caruncle,	1	–
Ruptured Uterus,	1	–			
			Vaginitis,	13	
Sapraemia,	1	–	Venereal Disease,	2	–
Sterility,	11	–			
Tubercular Affections,	6	–	Total of Patients treated,	442	–

RETURN showing number of DEATHS in "LABOUR" and "GYNÆCOLOGICAL" (Auxiliary) WARDS respectively, during year ended 31st March, 1895; exhibiting also other requested Particulars.

NAMES.	LABOUR DEPARTMENT.				GYNÆCOLOGICAL DEPARTMENT.			CAUSE OF DEATH AND OBSERVATIONS.
	Register No.	Admitted.	Delivered.	Died.	Reg. No.	Admitted.	Died.	
I. Kynes,	237,140	15. 8.94	16. 8.94	19. 8.94	—	—	—	Hyperemesis.
II. Howard,	—	—	—	—	7,129	31. 3.94	4. 4.94	Typhus fever.
III. Keegan,	237,154	18. 8.94	—	19. 8.94	—	—	—	Syncope due to prolonged labour.
IV. Devine,	—	—	—	—	7,115	19. 3.94	9. 4.94	Sepsis.
V. Hearty,	237,355	1.10.94	—	6.10.94	—	—	—	Sepsis.
VI. Jackson,	—	—	—	—	7,144	9. 4.94	9. 5.94	Peritonitis.
VII. Simott,	237,453	28.10.94	28.10.94	30.10.94	—	—	—	Cæsarean section, peritonitis.
VIII. Scott,	—	—	—	—	7,156	19. 4.94	8. 6.94	Tubercular peritonitis.
IX. Herbert,	237,666	28.12.94	28.12.94	25.12.94	—	—	—	Eclampsia.
X. Coombes,	—	—	—	—	7,190	27. 5.94	30. 5.94	Carcinoma.
XI. Layton,	237,864	9. 2.95	—	9. 2.95	—	—	—	Eclampsia.
XII. Newburn,	—	—	—	—	7,238	25. 6.94	20. 7.94	Myoma uteri, sepsis.
XIII. Goodeve,	—	—	—	—	7,248	4. 7.94	21. 8.94	Carcinoma.
XIV. Doyle,	—	—	—	—	7,312	30. 8.94	27. 9.94	Shock following operation for ruptured tubal pregnancy.
XV. Cleary,	—	—	—	—	7,318	4. 9.94	8. 9.94	Surgical kidney.
XVI. Phelan,	—	—	—	—	7,349	20. 9.94	21. 9.94	Rupture of uterus. Delivered at home.
XVII. Costello,	—	—	—	—	7,361	1.10.94	14.10.94	Sepsis. Sent up from the country.
XVIII. M'Ardel,	—	—	—	—	7,404	28.11.94	30. 1.95	Pyosalpynx.
XIX. Collins,	—	—	—	—	7,417	10.12.94	17.12.94	Carcinoma.
XX. Corrigan,	—	—	—	—	7,419	11.12.94	27.12.94	Phlebothrombosis.
XXI. Kelly,	—	—	—	—	7,428	24.12.94	9. 1.95	Ovarian tumour, twisted pedicle.
XXII. Keyes,	—	—	—	—	7,455	16. 1.95	3. 2.95	Myoma uteri.
XXIII. Thompson,	—	—	—	—	7,464	28. 1.95	5. 2.95	Carcinoma uteri.
XXIV. Ledwidge,	—	—	—	—	7,506	25. 2.95	31. 3.95	Tubercular peritonitis.
Total,	6	—	—	—	18			

Appendix.

No. 1.

Coombe Lying-in Hospital.

Coombe Lying-in Hospital.

Return of Diseases treated in the Gynæcological Wards, during the Year ended 31st March, 1895.

Abscess, Gluteal,	1	Parametritis Posterior,	1
,, of Labium,	1	Parametritis,	1
,, Mammary,	1	,, Puerperal,	4
Anæmia, Pernicious with Pregnancy,	1	Perimetritis,	1
Abortions,	3	Peritonitis,	5
,, Incomplete,	22	Pelvic Pain and Congestion,	3
,, Threatened,	19	Phlegmasia, Alba dolens,	1
Albuminuria c. Pregnancy,	3	Pneumonia,	2
Amenorrhœa,	2	Pregnancy c. Deformed Pelvis,	1
Anteversion and Anteflexion,	2	Prolapse of Uterus and Vagina,	5
Ascites,	2	,, Ovaries,	3
		Polypus, Uterine,	2
		,, Vaginal,	1
Condylomata,	1	Pyosalpinx,	3
Caruncle,	1		
Cystitis,	1	Retroversion and Retroflexion,	12
		,, of Gravid Uterus,	1
Dysmenorrhœa,	4	,, Adherent,	4
Dyspareunia,	2		
Dysuria,	2	Salpingitis,	1
		Stenosis of Cervix,	5
Emesis of Pregnancy,	1	Sterility,	1
Erosion of Cervix,	1	Subinvolution,	1
		Syphilis,	4
		Sapræmia,	2
Fibro-Myoma of Gravid Uterus,	1	Septicæmia (Puerperal),	2
Gastric Ulcer c. Anæmia,	2	Tumours of Abdomen,	5
Hæmatoma,	2		
Hæmorrhage, Secondary Post-partum,	1	Unclassed,	2
Hæmorrhage, Uterine,	27		
Hæmorrhoids,	1		
Hernia (Ventral),	3	Vesico-Vaginal Fistula,	1
Hysteria,	2	Vaginal Occlusion,	1
		Vaginitis and Vulvitis,	2
Laceration of Cervix,	6	,, Specific,	3
,, Perinæum,	4	Vulva Eczema and Pruritus,	1
,, Vagina,	3	,, Thrombus,	1
		Various,	27
Malignant Disease,	19	Wound of Labium,	1
Metritis and Endometritis,	24	,, Vestibule,	2
,, ,, Septic,	1	Weeping Cervicitis,	1
Metrorrhagia,	10		
Myomata,	4		
Menorrhagia,	5		
Ovaritis,	5	Remaining in Hospital on 1st April, 1895,	16
Ovarian Cyst,	1		

RETURN showing NUMBER of DEATHS in LABOUR WARDS, during the year ended 31st March, 1895, with other requested Particulars.

Appendix No. 1.

Coombe Lying-in Hospital.

No.	Labour Register No.	Age, Years	Date of Admission.	Date of Delivery.	Date of Death.	Cause of Death.
			1894.	1894.	1894.	
1	35	20	29 April,	30 April,	12 May, .	Parturition, Septic Peritonitis, Syncope.
2	122	38	21 July, .	23 July, .	23 July, .	Childbirth, Eclampsia, Asphyxia.
3	244	22	14 Nov., .	14 Nov., .	15 Nov., .	Pregnancy, Eclampsia, Asphyxia.
4	265	40	4 Dec., .	4 Dec., .	5 Dec., .	Parturition, Post Partum Hæmorrhage, Fatty Heart, Syncope.

RETURN showing NUMBER of DEATHS in "GYNÆCOLOGICAL" WARDS, during the year ended 31st March, 1895, with other requested Particulars.

No.	Chronic Register No.	Age, Years.	Date of Admission.	Date of Death.	Labour Register No.	Date of Delivery within one month *ante* Death.	Cause of Death.
			1894.	1894.			
1	57(*b*)	25	12 July, .	13 July, .	—	—	Profound blood poisoning, like that of acute yellow atrophy of the liver and causing abortion, coma, and exhaustion.
2	147	29	10 Nov., .	10 Nov., .	—	—	Pernicious Anæmia.
3	160	40	9 „ .	5 December,	241	13 Nov.,	Childbirth, Septicæmia, Syncope.
4	154	45	22 „ .	15 „ .		-	Malignant Disease, Abdominal Incision Suppurative Peritonitis, Syncope.

ROYAL HOSPITAL FOR INCURABLES, Year ended 31st March, 1895.

Royal Hospital for Incurables.

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Angina Pectoris, .	1	-	Hydrocephalus, . .	2	-
Ankylosis of Hip, . .	1	-	Laryngitis, . .	1	1
Asthma, . . .	1	-	Lupus, . . .	7	-
Bronchitis, Chronic, .	6	-	Lateral sclerosis, . .	-	1
Bronchocele, . .	1	-	Morbus Coxæ, . .	7	1
Cancer of Uterus, . .	8	4	Necrosis, . . .	1	-
,, Face, . .	5	2	Nephritis, . . .	3	1
,, Breast, . .	10	3	Paralysis, . . .	35	-
,, Rectum, .	2	2	Paraplegia, . .	2	2
,, Throat, . .	5	5	Phthisis Pulmonalis, .	40	18
,, Stomach, .	5	1	Rachitis, . . .	1	-
Caries, . . .	5	-	Rheumatism, Chronic, .	43	4
Chorea, . . .	1	-	Scrofula, . . .	3	-
Dropsy, . . .	1	-	Spinal Cord, Disease of, .	8	2
Gangrene, . .	1	-	Tabes, . . .	4	-
Gastritis, . . .	3	-	Tuberculosis, . .	5	-
Hernia, . . .	1	-	Tumours of Abdomen, .	5	-
Hæmorrhoids, . .	2	1	Ulcer of Leg, . .	4	-
Heart, Disease of, . .	31	6	Uterus, Disease of, .	3	2
Hemiplegia, . .	5	2			

Appendix.

No. 1.

Cork-street Fever Hospital

CORK-STREET FEVER HOSPITAL, Year ended 31st March, 1895.

Disease.	No. Treated.	No. Died.	Disease.	No. Treated.	No. Died.
Abscess,	6	–	Laryngitis,	2	1
Accident,	2	–	Lumbago,	1	–
Acne,	2	–	Lymphadenitis,	2	
Adenitis,	1	–	Lues,	5	
Ague,	1	–			
Alcoholism,	12	–	Measles,	30	3
Anæmia,	3	–	Marasmus,	2	–
Ascarides,	2	–	Mastitis,	1	–
Asthma,	4	–	Meningitis,	10	7
Bronchitis, Acute,	29	4	Not suitable,	5	–
Bursitis,	1	–	Nephritis,	4	1
			Neuralgia,	2	–
			Neuritis,	1	–
Cancer of Stomach,	1	1			
Carditis,	2	–			
Cerebral Congestion,	1	1	Observation,	23	–
Cephalalagia,	1	–	Odontalgia,	2	–
Cellulitis,	4	–	Otorrhœa,	1	–
Chlorosis,	1	–			
Cholerine,	4	–	Paronychia,	2	–
Colic,	4	–	Pericarditis,	1	–
Constipation,	2	–	Peritonitis,	1	1
			Puerperal,	1	–
			Pertussis,	9	3
			Phlegmasia dolens,	1	–
Delirium tremens,	1	–	Phthisis pulmonalis,	11	1
Diarrhœa,	3	–	Pleuritis,	4	–
Diphtheria,	8	1	,, c. effusion,	1	–
			Pneumonia,	82	17
			Purpura H.	1	–
Ecthyma,	1	–	Pyæmia,	1	1
Eczema,	4	–			
Empyema,	1	–	Rötheln,	14	–
Endocarditis,	1	–	Rheumatism, Acute,	24	–
Enteritis,	4	–			
Epistaxis,	1	–			
Erysipelas,	71	3	Scabies,	2	–
Erythema,	1	–	Scarlatina,	163	7
,, Nodosum,	4	–	Senectus,	1	–
			Stomatitis,	8	–
			Synovitis,	1	–
Fever, Enteric,	105	9			
,, Simple,	16	–			
,, Typhus,	15	2	Tabes,	7	–
			Tonsillitis,	10	–
			Tuberculosis,	1	–
Gastritis,	4	–	Typhlitis,	2	–
Gastralgia,	1	–			
			Urticaria,	5	–
Hæmoptysis,	4	–	Ulcerated Throat,	2	–
Hernia,	1	–			
Hysteria,	1	–			
			Varicella,	22	1
			Variola,	796	95
Icterus,	1	–			
Influenza,	15	–	Infants,	19	–
Iodism,	1	–	Minders,	31	–

WESTMORLAND LOCK HOSPITAL, Year ended 31st March, 1895.

Disease.	No. Treated.	No. Died.	Disease.	No. Treated	No. Died.
Abortion, Syphilitic,	3	–	Menorrhagia,	4	–
Abscess, Labial,	9	–			
,, (unspecified),	1	–			
Adenitis,	8	–			
Albuminuria and Rheumatism.	1	–	Neurasthenia,	1	–
Anæmia,	1	–			
			Ophthalmia Neonatorum,	3	–
			Ovaritis,	2	–
Birth, premature,	3	3	,, Gonorrhœal,	1	–
Bronchitis,	3	–			
Bubo,	9	–			
			Paronychia,	1	–
			Pediculi,	2	–
Contagious Moluschuna,	1	–	Periostitis,	1	–
Chancre,	23	–	Phthisis pulmonalis,	3	3
Chancroids,	28	–	,, ,, and Leucorrhœa.	1	–
Condylomata,	36	–			
Cynanche,	4	–	Pleuritis,	1	–
			Polypus, Aural,	1	–
			Porrigo,	1	–
			Purpura,	1	–
Diarrhœa, Enteric,	1	–			
Dysuria,	4	–			
			Rheumatism, Acute and Chronic.	11	–
Erythema,	1	–			
,, Nodosum,	1	–			
Excoriation,	8	–			
			Scabies,	4	–
			Sinus,	1	–
Febricula,	3	–	Synovitis,	2	–
Fissure,	5	–	Syphilis, Congenital,	4	2
			,, Primary,	28	–
			,, Secondary,	108	–
Gastrodynia,	1	–	,, Tertiary,	45	2
Gastro-duodenitis,	1	–			
Gleet,	2	–			
,, and Anæmia,	1	–			
,, and Gonorrhœal Rheumatism.	1	–	Tonsillitis,	5	–
			Tumour,	1	–
Gonorrhœa,	50	–	,, Suppurating sebaceous.	1	–
,, and Herpes,	1	–			
,, and Porrigo,	1	–	Tumour of Clitoris,	1	–
Hemiplegia,	1	–	Ulceration, Phagadenia,	1	–
Hypertrophy of Labia,	12	–			
			Vaginalis,	1	–
Inflammation of Lymphatics.	1	–			
Impetigo,	1	–	Warts,	9	–
Inanition,	1	1			
			Nil,	15	–
Leucorrhœa,	19	–			

Appendix.

No. 1.

St. Mark's Ophthalmic ospital.

St. Mark's Ophthalmic Hospital.

Abstract of the Diseases affecting 747 In-Patients treated in the Wards of the Hospital, and affecting the New Out-Patients treated at the Dispensary of the Institution, during the year ended 31st March, 1894.

Diseases of the Eye.	Out-Patients.			In-Patients.			Gross Total.			Operations.		
	M.	F.	Total.	M.	F.	Total.	M.	F.	Total.	M.	F.	Total
Palpebrae,	255	201	456	26	23	49	281	4	505			
Conjunctiva,	748	645	1,393	62	49	111	810	694	1,504			
Cornea,	350	313	663	111	80	191	461	393	854			
Sclerotica,	3	3	6	17	–	17	20	3	23			
Uvea A. Iris,	95	51	146	67	35	102	162	86	248			
B. Chorioidae et Corpus Ciliare,	29	13	42	7	2	9	36	15	51			
Corpus Vitreum,	8	7	15	3	–	3	11	7	18			
Retina et Nervus Opticus,	45	15	60	23	7	30	68	22	90			
Glaucoma,	7	6	13	15	8	23	22	14	36			
Bulbus,	13	10	23	38	12	50	51	22	73			
Lens,	74	66	140	82	40	122	156	106	262			
Refractio,	133	193	326	5	6	11	138	199	337			
Accommodatio,	24	26	50	–	–	–	24	26	50			
Musculi et Nervi,	55	45	100	11	12	23	66	57	123			
Orbita,	2	3	5	–	1	1	2	4	6			
Organa Lachrymalia,	15	29	44	1	4	5	16	33	49			
Total,	1,856	1,626	3,482	468	279	747	2,324	1,905	4,229			
Diseases of the Ear and Various.												
Auricle and Meatus,	246	180	426	1	4	5	247	184	431			
Tympanum,	327	312	639	13	20	33	340	332	672			
Labyrinth,	16	17	33	–	1	1	16	18	34			
Nasus,	3	2	5	2	2	4	5	4	9			
Pharynx et Larynx,	10	12	22	1	–	1	11	12	23			
Various and unknown (Eye and Ear),	–	–	–	–	6	6	–	6	6			
Total,	602	523	1,125	17	33	50	619	556	1,175			
Total Eye, Ear, and Various Diseases for year 1893-94,	2,458	2,149	4,607	485	312	797	2,943	2,461	5,404			

Appendix.
No. 2.
Average cost per Bed, 1894.

TABLE No. 2, showing the AVERAGE COST per BED occupied throughout the year ended 31st MARCH, 1895, for MAINTENANCE, and for ESTABLISHMENT, and for both, exclusive of Buildings and furnishing such Buildings.

NAME OF HOSPITAL.	Average daily number of Beds occupied throughout the year.	Average annual cost per bed for *Maintenance.	Average annual cost per bed for †Establishment, exclusive of buildings and furnishing such buildings.	Average annual cost per bed for Maintenance and for Establishment, exclusive of buildings and furnishing such buildings.
		£ s. d.	£ s. d.	£ s. d.
Westmorland Lock, . .	66·44	14 13 0½	25 18 7	40 11 7½
Steevens's, ...	99·43	25 0 4½	30 4 1¾	55 4 6½
Meath, ...	84·75	23 1 1¼	35 0 11½	58 2 0½
Cork-street Fever, . . .	101·98	21 13 11	42 19 11¼	64 13 10¼
House of Industry, . . .	132·14	15 2 10	36 8 4	51 11 2
Rotunda Lying-in, . . .	60·23	22 15 11¾	60 18 11	83 14 10¾
Coombe do., . . .	23·87	18 8 1¾	44 10 2¼	62 18 4
Incurables, ...	197·66	19 3 7	28 6 7	47 10 2
St. Mark's, ...	45·65	15 3 5½	21 0 3½	36 3 9

* Maintenance comprises provisions, groceries, alcoholic stimulants, drugs, leeches, surgical instruments, medical appliances, and clothing of patients.

† Establishment charges include salaries of officers, wages of servants, rations of officers and servants, clothing of servants, rent, taxes, insurance, soap, candles, fuel, gas-light, furniture, repairs, straw, bedding, utensils, buildings, and furnishing such buildings, stationery, printing, advertising burials, coffins, pensions, incidentals, and laundry expenses.

Appendix.

No. 2

Expenses of Hospitals.

TABLE No. 3, showing in detail the several CHIEF HEADS of EXPENDITURE of and to Establishment, and the

NAME OF HOSPITAL.	EXPENDITURE FOR MAINTENANCE FOR						
			Stimulants.				
	Provisions.	Groceries.	Wine.	Whiskey, Brandy, &c.	Ale and Porter.	Drugs and Leeches.	Surgical Instruments and other Medical and Surgical Appliances.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Westmorland Lock,	594 13 0	54 4 8	21 11 6	15 17 11	29 16 1	208 2 9	18 7 1
Steevens's,	1,611 3 10	107 6 9	–	111 12 0	33 3 0	388 13 2	235 14 4
Meath,	1,207 11 9	74 19 9	10 19 0	44 5 2	16 12 0	418 6 3	181 5 5
Cork-street,	1,249 7 1	382 11 2	57 12 0	65 12 10	49 1 9	187 3 5	39 7 9
House of Industry,	1,220 5 3	124 17 1	23 10 6	59 16 4	15 10 4	270 19 10	277 7 0
Rotunda Lying-in,	769 14 2	64 3 5	–	53 15 5	–	334 16 1	132 10 6
Coombe do.	250 3 9	34 5 0	0 2 1	19 18 8	–	104 0 3	22 10 3
Incurables,	2,921 0 10	134 5 9	71 4 0	180 9 0	56 0 0	96 16 8	49 17 10
St. Mark's,	488 19 0	45 8 11	–	0 17 6	–	96 1 1	58 11 8
Totals,	10,312 18 8	1,022 2 6	184 19 1	552 4 10	200 3 2	2,105 7 6	1,015 11 10

NAME OF HOSPITAL.	EXPENDITURE FOR ESTABLISHMENT FOR						
	Rent, Taxes, and Insurance.	Soap and Candles.	Coals and other Fuel, and Gas-light.	Furniture and Repairs.	Straw, Bedding, and Utensils.	Buildings, and Furnishing such Buildings.	Stationery, Printing and Advertising.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Westmorland Lock,	24 1 8	38 13 10	248 7 10	58 8 4	37 10 3	101 2 6	31 3 10
Steevens's,	97 10 10	52 17 3	460 2 8	223 11 9	186 9 2	253 10 8	72 13 7
Meath,	50 4 3	111 8 8	375 12 2	250 10 1	–	373 12 8	71 18 3
Cork-street,	120 13 4	84 7 6	426 12 5	779 16 9	–	695 14 3	95 7 2
House of Industry,	427 7 8	94 18 2	554 11 4	84 12 9	122 11 7	701 13 9	78 16 8
Rotunda Lying-in,	92 17 7	53 0 6	425 6 7	251 3 6	113 17 8	417 2 3	194 14 9
Coombe do.	51 8 8	11 0 10	138 5 4	102 1 11	42 0 0	220 10 6	41 1 0
Incurables,	115 5 4	–	624 3 2	161 17 1	148 6 11	248 5 5	96 13 7
St. Mark's,	50 19 9	16 13 2	116 10 7	73 18 0	26 8 0	107 3 3	108 5 9
Totals,	1,030 9 1	462 19 11	3,369 12 1	1,986 0 2	677 3 7	3,118 15 3	790 14 7

(*a*) Includes £300 donation invested.

(*b*) Includes £205 0s. 8*d.*, Conveyance of patients.
(*c*) Includes £2,824 11s. 6*d.* transferred to Building

Appendix.

No. 3.

Expenses of Hospitals.

each HOSPITAL, in the Year ended 31st March, 1895, in respect to Maintenance, Total Expenditure for Maintenance.

Clothing of Patients.	Total Maintenance.	Expenditure for Establishment for: Salaries of Officers.	Wages of Servants.	Rations of Officers and Servants.	Clothing of Servants	Name of Hospital.
£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
30 16 7	973 9 7	742 10 8	296 6 1	155 1 1	34 3 10	Westmorland Lock.
–	2,487 13 1	537 10 9	649 4 11	640 3 5	–	Steevens's.
–	1,953 19 4	419 18 4	488 10 8	521 19 4	81 10 4	Meath.
181 15 4	2,212 11 4	743 19 1	1,062 11 9	694 4 1	–	Cork-street.
9 8 10	2,001 15 2	883 6 2	1,071 13 1	878 0 2	80 9 0	House of Industry.
18 5 0	1,373 4 7	617 11 2	421 0 11	905 4 7	33 0 10	Rotunda Lying-in.
8 7 10	439 7 10	143 6 8	171 7 5	151 13 5	17 2 1	Coombe do.
281 7 8	3,791 1 9	592 13 4	762 0 3	–	–	Incurables.
2 7 0	692 13 2	187 5 11	139 5 0	111 10 9	2 8 2	St. Mark's.
532 8 3	15,925 15 10	4,873 2 1	5,062 0 1	4,057 16 10	248 14 3	Totals.

Expenditure for Establishment for: Burials and Coffins.	Pensions.	Incidentals.	Laundry Expenses.	Total Establishment.	Total Expenditure.	Name of Hospital.
£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
11 15 6	19 12 0	25 0 1	–	1,823 17 6	2,797 7 1	Westmorland Lock.
–	–	83 7 2	–	3,257 2 2	5,744 15 3	Steevens's.
5 4 11	70 0 0	*a*528 9 1	–	3,343 18 9	5,297 18 1	Meath.
40 5 6	18 4 0	*b*318 15 8	–	5,080 11 6	7,293 2 10	Cork-street.
41 10 6	394 8 11	95 11 3	–	5,514 11 0	7,516 6 2	House of Industry.
21 1 6	210 0 0	*c*119 15 11	212 0 0	4,087 17 9	5,461 2 4	Rotunda Lying-in.
–	–	*d*103 2 1	90 0 0	1,282 19 11	1,722 7 9	Coombe do.
23 14 6	–	*e*3,074 18 2	–	5,847 17 9	9,638 19 6	Incurables.
–	–	29 12 5	96 9 2	1,066 9 11	1,759 3 1	St. Mark's.
143 12 5	712 4 11	4,373 11 10	398 9 2	31,305 6 3	47,231 2 1	Totals.

(*c*) Includes £45 10*s.* 9*d.* Law Expenses.
fund and £78 10*s.* 8*d.* Rathmines Water Bill.

(*d*) Includes £57 Bank Interest.

TABLE No. 4.

Showing the several Sources of INCOME of each HOSPITAL, in the Year ended 31st March, 1895.

NAME OF HOSPITAL.	INCOME FROM															
	Government Grants.	Treasury Receipts under County Infirmary Acts.	Subscriptions and Donations.	Bequests.	Interest on Property.	Assessments on County of Dublin.	Assessments on City of Dublin.	House, Landed, or other Property.	Pay Patients.	Female Pupils.	Charity Sermons	Annuities.	Profits from Rotunda Rooms and Garden, &c.	Government Stocks sold.	Incidentals.	Total Income.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Westmorland Lock,	2,600 0 0	–	–	–	–	–	–	–	–	–	–	–	–	–	a405 4 11	3,005 4 11
Steevens's,	1,300 0 0	–	439 15 5	100 0 0	260 7 0	–	200 0 0	1,833 5 1	1,933 5 5	149 0 0	107 15 2	–	–	–	–	6,328 8 1
Meath,	600 0 0	86 2 6	1,510 17 2	36 0 0	575 4 0	1,000 0 0	300 0 0	397 13 9	369 13 0	–	364 13 11	–	–	–	11 19 1	5,252 3 5
Cork-street,	2,500 0 0	–	995 8 9	2,515 4 0	1,022 7 2	125 0 0	600 0 0	217 7 6	381 6 6	–	180 3 6	25 16 10	–	–	44 9 9	8,557 4 0
House of Industry,	7,472 15 9	–	–	–	115 3 7	–	–	–	775 11 9	–	–	–	–	–	246 17 6	8,610 8 7
Rotunda Lying-in,	700 0 0	–	905 2 7	700 0 0	347 8 4	–	250 0 0	892 19 8	566 12 0	1,227 13 6	206 11 11	150 16 0	178 14 7	–	136 3 6	5,762 2 1
Coombe do.	200 0 0	–	353 3 4	1,107 16 8	146 19 1	–	500 0 0	–	58 7 6	340 3 4	111 2 10	–	–	–	–	2,817 12 9
Incurables,	250 0 0	43 1 3	914 3 6	3,022 1 7	3,928 10 8	–	350 0 0	61 19 0	–	–	–	–	–	–	43 2 7	8,612 18 7
St Mark's,	100 0 0	–	393 5 5	50 0 0	135 12 10	–	150 0 0	–	749 9 8	–	169 12 11	–	–	–	109 18 7	1,857 19 5
Total,	15,722 15 9	129 3 9	5,511 16 2	7,531 2 3	6,531 12 8	1,125 0 0	2,350 0 0	2,903 5 0	4,839 5 10	1716 16 10	1090 0 3	176 12 10	178 14 1	–	997 15 11	50,864 1 10

(a) Includes £400 from War Department.

TABLE No. 5, showing the Number of PATIENTS treated in each INSTITUTION under the Supervision of the Board of Superintendence of Dublin Hospitals, in the Year ended 31st March, 1895; the Mortality in each; the Average Daily Number in Hospital during the Year; and the present extent of Accommodation for each class of Patients.

NAME OF HOSPITAL.	Number of Patients Admitted, Discharged, Died, &c.										Present Bed Accommodation for								
	Number remaining on the 1st April, 1894.	Admitted in the year ended 31st March, 1895.	Discharged in the year.	Died in the year.	Remaining on the 31st March, 1895.	Total under treatment in the year.	Total treated to a termination.	Average daily number of Beds occupied through the year.	Average number of Days spent in Hospital by each under treatment.	Mortality per cent. on the total treated to a termination.	Fever Patients.	Other Medical Patients.	Surgical Patients.	Syphilitic and Gonorrhœal Patients.	Lying-in Hospital Patients.		Incurable Patients.	Ophthalmic Patients.	Total Bed Accommodation.
															Labour Patients.	Chronic Female Diseases.			
Westmorland Lock,	69	(a) 507	493	11	72	576	504	66·44	42·10	2·18	–	–	–	80	–	–	–	–	80
Steevens's,	116	1,346	1,288	65	109	1,462	1,353	99·43	24·82	4·8	20	54	141	15	–	–	–	–	230
Meath,	95	1,173	1,117	67	84	1,268	1,184	84·75	24·40	5·65	14	37	64	–	–	–	–	–	115
Cork-street Fever,	78	1,661	1,499	158	82	1,739	1,657	101·98	21·40	9·53	120	–	–	–	–	–	–	–	120
House of Industry:																			
Hardwicke,	23	784	731	58	18	807	789	42·62	17·04	7·35	120	–	–	–	–	–	–	–	120
Whitworth,	34	627	558	55	48	661	613	36·54	19·65	8·97	–	82	–	–	–	–	–	–	82
Richmond,	54	693	666	26	55	747	692	52·98	21·81	3·75	–	–	120	–	–	–	–	–	120
Rotunda Lying-in:																			
Labour Wards,	36	1,538	(b) 1,539	6	29	1,574	1,245	32·60	7·56	0·48	–	–	–	–	70	–	–	–	70
Chronic do.,	22	420	396	18	28	442	414	27·62	22·81	4·34	–	–	–	–	–	35	–	–	35
Coombe Lying-in:																			
Labour Wards,	13	499	(c) 495	4	13	512	403	11·30	8·05	0·99	–	–	–	–	41	–	–	–	41
Chronic do.,	8	263	251	4	16	271	255	12·57	16·93	1·56	–	–	–	–	–	24	–	–	24
Incurables,	180	91	(d) 2	59	210	271	61	197·66	266·22	96·72	–	–	–	–	–	–	180	–	180
St. Mark's,	45	700	698	–	47	745	698	45·65	22·36	–	–	–	–	–	–	–	–	50	50
Total,	773	10,302	9,733	531	811	11,075	9,868	812·14	–	–	274	173	325	95	111	59	180	50	1,267

(a) Includes 17 born in the House.
(b) Includes 300 non-parturient.
(c) „ 96 „
(d) Resigned.

Appendix.

No. 6.

Price Lists.

No. 6.

PRICE LIST of ARTICLES supplied to the HOUSE OF INDUSTRY GOVERNMENT HOSPITALS, per Contract or otherwise, for the year ending 31st March, 1895.

Article.	Rate.	Remarks.
	£ s. d.	
1. Beef, . . per lb.	0 0 7	Shoulders, necks, tail end, without bone.
	0 0 8	Round, without fat or bone.
2. Mutton, . . ,,	0 0 8	Legs, with short laps.
3. Bacon, . . ,,	0 0 8½	Best Limerick Middles.
4. Bread, . . ,,	0 0 0 5/16	Equal to 3¾d. for 4 lbs.
5. Oatmeal, . . per stone	0 2 0	
6. Potatoes, . . ,,	0 0 6½	
7. Rice, . . ,,	0 1 6	
8. Tea, . . per lb.	0 1 5	
9. Sugar, . . ,,	0 0 1½	
10. Coffee, . . ,,	0 1 7	
11. Cocoa, . . ,,	—	Not in dietary
12. New Milk, . per gal.	0 0 7	
13. Buttermilk, . ,,	0 0 2	
14. Whiskey, . ,,	0 14 6	
15. Brandy, . ,,	1 0 0	
16. Wine, Port, ,,	0 7 6	
Marsala, ,,	0 6 6	
17. Porter, . . per ½ brl.	0 6 8	
18. Butter, . . per lb.	0 1 0	
19. Eggs, . . per doz.	0 1 0	
20. Soap, Brown, per cwt.	0 19 0	
Crown, ,,	0 19 9	
White, ,,	1 3 0	
21. Coals, . . per ton.	0 14 9	Wigan.

PRICE LIST of ARTICLES supplied to the MEATH HOSPITAL, per Contract or otherwise, for the year ending 31st March, 1895.

Article.	Rate.	Remarks.
	£ s. d.	
1. Beef, . . per lb.	0 0 4¾	
2. Mutton, . . ,,	0 0 7½	
3. Bacon, . . ,,	0 0 8	
4. Bread, ...	—	Current prices, 10 p. cent. discount off.
5. Oatmeal, . . per stone	0 1 9	
6. Potatoes, . . ,,	0 0 7½	Average.
7. Rice, . . ,,	0 2 6	
8. Tea, . . per lb.	0 1 8	
9. Sugar, . . per cwt.	0 16 6	
10. Coffee, . . per lb.	0 1 8	
11. Cocoa, . . per tin	0 0 8	
12. New Milk, . per gal.	0 0 8½	
13. Buttermilk, . ,,	0 0 2	
14. Whiskey, . ,,	0 13 6	
15. Brandy, . . ,,	0 19 6	
16. Wine (Port), per octave.	7 4 0	
17. Porter, . . per ½ brl.	0 19 6	Guinness's XX.
18. Butter, . per lb.	0 0 11½	Average.
19. Eggs . . per doz.	0 1 0	Do.
20. Soap, White, per cwt.	0 15 6	
Brown, ,,	0 14 6	
21. Coals, . . . per ton	0 14 6	

Appendix. — No. 6. — Price Lists

PRICE LIST of ARTICLES supplied to the ROTUNDA LYING-IN HOSPITAL per Contract or otherwise, for the Year ending 31st March, 1895.

Article.	Rate. £	s.	d.	Observations.
1. Beef, . . per lb.	0	0	7	
2. Mutton, . ,,	0	0	7	
3. Bacon, . ,,	0	0	8	
4. Bread, . per 2-lb. loaf,	0	0	2¼	Less 11 per cent. discount.
5. Oatmeal, per cwt.	0	12	0	
6. Potatoes, . .		—		At market prices.
7. Rice, . per stone,	0	1	9	
8. Tea, . . per lb.	0	1	4	
9. Sugar, . . per stone,	0	1	10	
10. Coffee, . per lb.	0	1	5	
11. Cocoa, . ,,		—		
12. New Milk, . per gal.	0	0	8	
13. Buttermilk, . ,,		—		Not used.
14. Whiskey, . ,,	0	19	6	
15. Brandy, . . .		—		Not used.
16. Wine, Port, per doz.	1	6	0	
17. Porter, . . .		—		Not used.
18. Butter, . . per lb.	0	1	2	
19. Eggs, . . per doz.	0	1	0	
20. Soap, . . per cwt.	0	15	0	
21. Candles, . . .		—		
22. Coals, . . per ton,		—		

PRICE LIST of ARTICLES supplied to the COOMBE LYING-IN HOSPITAL per Contract or otherwise, for the year ending 31st March, 1895.

Article.	Rate. £	s.	d.	Remarks.
1. Beef, . . per lb.	0	0	7	
2. Mutton, . . ,,	0	0	7	
3. Bacon, . . ,,	0	0	7	
4. Bread, . per 2-lb. loaf,	0	0	2	Less 10 per cent. discount.
5. Oatmeal, . . per stone,	0	2	0	
6. Potatoes, . . ,,	0	0	7	
7. Rice, . . ,,	0	2	4	
8. Tea, . . . per lb.	0	1	4	
9. Sugar, . . ,,	2*d.* and 1½*d.*			
10. Coffee, . . ,,		—		
11. Cocoa, . . ,,		—		
12. New Milk, . per gal.	0	0	8½	
13. Buttermilk, . ,,	0	0	2	
14. Whiskey, . ,,	0	17	2	
15. Brandy, . . per flask	0	5	0	
16. Wine, ...		—		
17. Porter, ...		—		
18. Butter, . . per lb.	0	1	0	
19. Eggs, . . per doz.	0	1	0	
20. Soap, . . per stone,	0	3	0	
21. Coals, . . per ton,	0	14	0	

Appendix. — No. 6. — *Price Lists.*

PRICE LIST of ARTICLES supplied to the ROYAL HOSPITAL for INCURABLES, per Contract or otherwise, for the Year ending 31st March, 1895.

Article.	Rate. £ s. d.	Remarks.
1 Beef, per lb.	0 0 6	
2. Mutton, „	0 0 7	
3. Bacon, „	0 0 8	
4. Bread, per 2 lbs. loaf	0 0 $2\frac{1}{8}$	
5. Oatmeal, per cwt.	0 14 0	
6. Potatoes, per stone,	0 0 6	
7. Rice, per stone,	0 4 0	
8. Tea, per lb.	0 1 8	
9. Sugar, per cwt.	0 16 0	
9. Sugar, per lb.	0 0 $1\frac{5}{7}$	
10. Coffee, „	0 1 10	
11. Cocoa, „	0 0 $4\frac{1}{2}$	
12. New Milk, per gal.	0 0 8	
13. Buttermilk, „	—	
14. Whiskey, „	0 15 4	
15. Brandy, „	1 4 0	
16. Wine, Port, per doz.	1 4 0	
16. Wine, Marsala, „	0 16 0	
17. Porter, per gal.	0 0 10	
18. Butter, per lb.	0 0 11	
19. Eggs, per doz.	0 1 0	
20. Soap, Crown, per cwt.	1 1 0	
20. Soap, Brown, „	0 19 6	
21. Coals, per ton	0 14 9	
22. Slack, „	0 9 9	

PRICE LIST of ARTICLES supplied to the CORK-STREET FEVER HOSPITAL, per Contract or otherwise, for the year ending 31st March, 1895.

Article.	Rate. £ s. d.	Remarks.
1. Beef, Rounds, per lb.	7*d.* & 7*d.*	
1. Beef, Ribs „	6*d.* & 7*d*	
1. Beef, Corned „	5*d.* & $5\frac{1}{2}$*d.*	
2. Mutton, „	$7\frac{1}{2}$*d.* & $7\frac{3}{4}$*d.*	
3. Bacon, „	0 0 8	
4. Bread, per 2 lb. loaf, nett	$1\frac{9}{10}$*d.* & $1\frac{3}{4}$*d.*	
5. Oatmeal,	—	No Contract.
6. Potatoes,	—	
7. Rice, per stone,	—	
8. Tea, per lb.	0 1 9	
9. Sugar, „	0 0 2	
10. Coffee,	—	No contract.
11. Cocoa,	—	
12. New Milk, per gal.	0 0 8	
13. Buttermilk, „	0 0 2	
14. Whiskey, „	0 17 6	
15. Brandy, per bot.	0 3 9	
16. Wine, per quart bot.	0 2 0	
17. Porter, per doz., large,	0 3 6	
18. Butter,	—	Wholesale market price.
19. Eggs, per doz.	—	
20. Soap,	—	
21. Coals, per ton,	0 15 9	House Coals.
21. Coals, per ton,	0 16 0	
21. Coals, per ton,	0 16 6	
22 Do., „	0 14 3	Steam Coals.

PRICE LIST of ARTICLES supplied to the WESTMORLAND LOCK (GOVERNMENT) HOSPITAL, per Contract or otherwise, for the year ending 31st March, 1895.

Article.	Rate. £	s.	d.	Remarks.
1. Beef, per lb.	0	0	5¾	
2. Mutton, „	0	0	6¾	
3. Bacon, „	0	0	8	
4. Bread, „	0	0	0 3/13	Equal to 3¾*d.* per 4 lb. loaf.
5. Oatmeal, per stone,	0	1	9	
6. Potatoes, „	0	0	8	Average price.
7. Rice, „	0	1	9	
8. Tea, „	0	1	4	
9. Sugar, „	0	0	1¾	
10. Coffee,		—		Not in dietary.
11. Cocoa,		—		do.
12. New Milk, per gal.	0	0	7½	
13. Buttermilk, „	0	0	2	
14. Whiskey, „	0	16	6	Proof.
15. Brandy, „	1	0	0	
16. Wine, Marsala, „	0	7	0	
Port, „	0	7	0	
17. Porter, in wood, per ½ brl.	0	13	4	
in bottle, „ doz.	0	1	4	
18. Butter, per lb.	0	0	10	
19. Eggs, per doz.	0	1	0	
20. Soap, White, per cwt.	1	1	0	
Brown, „	0	19	0	
Crown, „	0	17	0	
21. Coals, per ton,	0	16	6	Wallsend, delivered.

PRICE LIST of ARTICLES supplied to the ST. MARK'S OPHTHALMIC HOSPITAL, per Contract or otherwise, for the year ending 31st March, 1895.

Article.	Rate. £	s.	d.	Remarks.
1. Bread,		—		At current price, less 15 % discount.
2. Mutton, per lb.	0	0	7½	
3. Bacon, „	0	0	9	
	0	0	7	
4. Oatmeal, per stone,	0	2	0	
	0	1	6	
5. Potatoes, „	0	0	6	Varies.
6. Rice, „	0	2	3	
7. Tea, per lb.	0	1	3	
8. Sugar, per stone,	0	2	1½	
9. Coffee,		—		Not used.
10. Cocoa,		—		
11. New Milk, per gal.	0	0	7½	From April to September
	0	0	10	From November to March.
12. Buttermilk,		—		Not used.
13. Whiskey, per pint,	0	2	6	
14. Brandy,		—		Not used.
15. Wine,		—		
16. Porter,		—		
17. Butter, per lb.	0	1	2	
	0	1	0	
	0	0	9	
18. Eggs, per doz.	0	1	0	
	0	1	2	
19. Soap, per cwt.	0	16	0	
	0	17	6	
20. Coals, per ton	0	16	0	

Appendix. No. 6. *Price Lists.*

PRICE LIST of ARTICLES supplied to STEEVENS'S HOSPITAL, per Contract or otherwise, for the year ending 31st March, 1895.

Article.	Rate. £ s. d.	Remarks.
1. Beef, per lb.	0 0 5½	Rounds.
	0 0 6½	Ribs.
	0 0 3	Legs.
2. Mutton, ,,	0 0 6½	
3. Bacon, ,,	0 0 8	
4. Bread,	—	¼*d.* off current prices, less 10 per cent.
5. Oatmeal, per cwt.	0 15 0	
6. Potatoes, ,,	0 5 6	
7. Rice, ,,	0 13 0	
8. Tea, per lb.	0 1 6	
9. Sugar, ,,	—	Moist 1½*d.*, Loaf 2*d.*
10. Coffee, ,,	0 1 7	
11. Cocoa, shell, ,,	0 0 3½	Van Houten's 9½*d.* per tin.
12. New Milk, per gal.	0 0 8	
13. Buttermilk, ,,	—	
14. Whiskey, ,,	0 13 0	
15. Brandy, ,,	1 5 0	
16. Wine, Port, per doz.	1 0 0	
17. Porter, per brl.	1 19 0	
18. Butter, per lb.	0 1 0	
19. Eggs,	0 9 6	Per 120.
20. Soap, per cwt.	—	
	—	
21. Coals, per ton,	0 13 0	

Appendix No. 7. *Dietaries.*

TABLE No. 7.—DIETARIES.

WESTMORLAND LOCK HOSPITAL.

DIETS.	Breakfast.	Dinner.	Supper.
Low Diet.	Bread, 4 oz. Tea, ¾ pint.	Bread, 4 oz. New Milk, ¾ pint. On Friday—Bread, 4 oz.; New Milk, ¾ pint; Gruel, ¾ pint.	Bread, 4 oz. Tea, ¾ pint. Whey, ¾ pint.
Middle Diet,	Bread, 6 oz. Tea, ¾ pint.	Bread, 6 oz., or Potatoes, 1 lb. Mutton (Leg), roast or boiled, 8 oz. On Friday—Bread, 6 oz.; Gruel, ¾ pint, instead of Mutton.	Bread, 4 oz. Tea, ¾ pint.
Full Diet.	Bread, 8 oz. Tea, ¾ pint.	Bread, 6 oz., or Potatoes, 1 lb. Beef, boiled or stewed, 8 oz., and broth, ¾ pint. On Friday—Bread, 8 oz.; Gruel, ¾ pint, instead of Potatoes, Beef, &c.	Bread, 4 oz. Tea, ¾ pint.
Children's Diet.	N. Milk, 1 pt. Bread, 6 oz. (daily.)	Extras, if prescribed.	
Admission Diet.	Each Adult Patient to get on day of Admission, Dinner, Bread, 8 oz.; Supper, Bread, 4 oz.		

EXTRAS ALLOWED (if specially prescribed) WITH THE UNDERMENTIONED DIETS.

Low Diet.—One Egg; Beef Tea, ¾ pint, or New Milk, ¾ pint, or Arrowroot, ¾ pint, or Rice Milk, ¾ pint. Wine, or Whiskey, or Gin, as specially prescribed.

Middle Diet.—Bread, 4 oz.; 1 Egg; New Milk, ¾ pint, or Porter, ½ pint, or Gin or Wine, Whiskey or Brandy, as prescribed.

Full Diet.—Bread 4 oz.; 1 Egg; New Milk, ¾ pint, or Porter, ½ pint; or Wine, Whiskey, or Brandy, as prescribed.

Children's Diet.—Bread, 4 oz.: New Milk, ¾ pint; Arrowroot or Sago, 1 oz.; Sugar with A. or S. ½ oz.; or Beef Tea, ¾ pint.

FORMULARIES.

Tea (8¾ pints).	Beef, with Broth (8¾ pints).	Beef Tea (8¾ pints).
Tea, . . . 1½ oz. Sugar, . . 4 oz. New Milk, . ½ pt. Allowance for each Patient per diem— Tea for Bkt. ⅞ oz. } ⅜ oz. ,, Supr. ⅞ oz. } Sugar Bkt. ½ oz. } ,, Supr. ½ oz. } 1 oz. New Milk, . ⅛ pt.	Beef, exclusive of bone, 4 lb. Barley, . . . ¼ lb. Oatmeal, . . . 1 oz. Parsley, . . . 1 oz. Thyme, . . . ¼ oz. Onions or Leeks . . ½ lb. Pepper and Salt to taste.	Beef (lean without bone), 6 lbs. Pepper and Salt to taste. Allowance for each Patient— Beef to make ¾ pt. B. T., 12 oz.

Whey (8¾ pints).	Gruel (8¾ pints).	Arrowroot or Rice Milk (¾ pint).
New Milk, 2 quarts. Butter Milk, 1 quart. Allowance for Whey each Patient— New Milk, . ½ pt. Buttermilk, . ½ pt.	Oatmeal . . . 12 oz. Sugar . . . . 4 oz. Ginger to flavour. Steep the meal from night before. Boil for two hours. Allowance for each Patient for Gruel— Oatmeal . . . 1½ oz. Sugar . . . ½ oz.	Arrowroot or Rice, . 1 oz. Sugar, ... ½ oz. New Milk, . . . ¼ pt.

Breakfast at Nine o'clock, A.M., Dinner at Two o'clock, P.M., Supper at Seven o'clock, P.M.

RICHMOND, WHITWORTH, and HARDWICKE HOSPITALS.

DIETS.	Breakfast.	Luncheon.	Dinner.	Tea.	Supper.
Low,	Tea, 1 pint; bread and butter, 6 oz. and egg.	Milk, 1 pint; bread. 6 oz.	Milk pudding or beef-tea,	Bread and butter, 6 oz.; tea, with milk and sugar, 1 pint.	Bread and milk or gruel.
MIDDLE.					
Sun., .	Bread and butter, 6 oz.; tea, with milk and sugar, 1 pint.	Bread, 6 oz.; milk, 1 pint.	Roast mutton, ½ lb.; potatoes, 1 lb.; and vegetables.	Tea, 1 pint, with milk and sugar; bread, 6 oz.	Bread and milk or porridge.
Mon., .	do.	do.	Stewed beef, ½ lb.; potatoes, 1 lb; soup, 1 pint; and cabbage.	do.	do.
Tues., .	do.	do.	Boiled mutton, ½ lb.; potatoes, 1 lb., and turnips.	do.	do.
Wed., .	do.	do.	Roast beef, ½ lb.; potatoes, 1 lb.	do.	do.
Thurs., .	do.	do.	Irish stew, . .	do.	do.
Frid., .	do.	do.	Fish or mutton, ½ lb. each; potatoes, 1 lb.	do.	do.
Sat., .	do.	do.	Roast mutton, ½ lb.; potatoes, 1 lb.; and vegetables.	do.	do.

Appendix, No. 7. *Dietaries.*

Cork-street Hospital

Low Diet.

Beef Tea; Milk; Rice; Tea; Bread.

Extra Beef Tea when ordered by Physicians—1 lb. Beef to 1 pint water.

Full Diet.

8 oz. Mutton; Soups; Bread.

Extras ordered by Physicians—Eggs, Chicken, Chicken Jelly, Milk Pudding, Fish, &c., Potatoes.

Doctor Steevens's Hospital.

Scale of Diets used.

Full Diets—Breakfast.

1 pint Tea, 6 oz. Bread, ¾ oz. Butter.

Dinner.

Sunday, Tuesday, Thursday,	Roast or Boiled Mutton, 6 oz.; Vegetables, 1 lb. Potatoes.
Monday, Wednesday, Saturday,	1 pint Soup, 6 oz. Stewed Beef, and 1 lb. Potatoes.
Friday,	10 oz. Fish, and 1 lb. Potatoes.
Lunch,	1 pint Milk, and 2 oz. Bread.
Tea,	1 pint Tea, ¾ oz. Butter, and 4 oz. Bread.
Supper,	1 pint Milk.

Extra Diets.

Beef Tea, Chops, Chickens, Milk, Eggs, Fish, Jellies, Puddings, Cocoa, Coffee, Porridge, and Stimulants, as ordered by Physicians and Surgeons.

Meath Hospital.

PATIENTS' DIETARY.

The Patients' Dietary has been revised, and the following recommended on the 13th February, 1893, to be tried for three months, and if approved, then to be permanently adopted:—

Full Diet—Breakfast.

Tea, with Milk and Sugar, 1 pint, Bread, with Butter, 6 oz.

Dinner.

Sunday,	Roast Legs of Mutton, 6 oz., with Vegetables and Potatoes.
Monday,	Stewed Beef, 6 oz., Soup, 1 pint, and Potatoes.
Tuesday,	Boiled Legs of Mutton, 6 oz., and Potatoes.
Wednesday,	Stewed Beef, 6 oz., Soup, 1 pint, and Potatoes.
Thursday,	Roast Legs of Mutton, 6 oz., with Vegetables and Potatoes.
Friday,	White Fish, 10 oz., and Potatoes.
Saturday,	Stewed Beef, 6 oz., Soup, 1 pint, and Potatoes.
Tea,	Tea, with Sugar and Milk, 1 pint, Bread, with Butter, 6 oz., or Oatmeal Porridge, 16 oz., and New Milk, 1 pint.
Supper,	Milk or Whey, 1 pint.

Fever Diet.

Per Diem,	Milk, Barley-Water, Beef Tea, &c., as ordered by Physician.

Special Diet.

Breakfast,	Same as Full Diet.
Dinner,	As ordered by Physician or Surgeon.
Tea,	Same as Full Diet.
Supper,	Ditto.

The Medical Attendant can order, when necessary, Beef Tea, Milk, Eggs, Chop, Fowl, Fish, Rice, Puddings, Fruit, Cocoa, Ice, Mineral Waters, Stimulants, &c.; but they will be given only when signed for by him.

Coombe Lying-in Hospital.

No Extras allowed unless ordered each day and initialled by one of the Medical Officers.

Diets.	Breakfast.	Dinner and Luncheon.	Supper.
No. 1,	Tea, 1 pint. Bread, 4 oz.	Luncheon—Milk, ½ pint. Mutton, ½ lb.; bread, 4 oz.; ox head soup, 1 pint.	Tea, 1 pint; bread, 4 oz. Supper—Milk, ½ pint, or gruel, 1 pint.
No. 2,	Tea, 1 pint. Bread, 4 oz.	Luncheon—Milk, ½ pint. Ox-head soup, 1 pint; bread, 4 oz.; whey, 1 pint, 4 o'clock.	Tea, 1 pint; bread, 4 oz. Supper—Gruel, 1 pint, contains ½ pint milk.
No. 3,	Tea, 1 pint. Bread, 4 oz.	Luncheon—Milk, 1 pint. Special beef tea, 1 pint; whey or milk, 1 pint, 4 o'clock.	Tea, 1 pint; bread, 4 oz. Supper—Milk, 1 pint.
No. 4,	Slop Diet in 24 Hours:— Special beef tea, ... 2 pints. Milk, ... 4 pints.		

Breakfast, 7.30 A.M.; Luncheon, 11 A.M.; Dinner, 1 P.M.; Tea, 5 and 6 P.M.; Supper, 8.30 P.M.

Extras and Stimulants as ordered in all diets.

Tea, ¼ lb.; sugar, 1 lb.; milk, 2 pints—supplies 15 patients for 24 hours.
Bread, 2 lbs. loaf—6 lbs. supplies 8 patients for 24 hours.
Ox-head broth—½ ox-head for broth, thickened with barley and dried vegetables, for 10 patients.
Special beef tea—gravy beef, ¾ lb. to 1 pint.
Whey—milk, ½ pint, and buttermilk, ½ pint, to make 1 pint.
Gruel—oatmeal, 1 oz., to milk, ½ pint, for 1 pint.

Formularies.

Tea (7½ pints).	Boiled Beef with Broth (18 pints).	Beef Tea (6 pints).
Tea, . . 2 oz. Sugar, . 6 oz. New Milk, ½ pint	Beef (exclusive of bone), . 9 lb. Onions or Leeks, . . ½ lb. Pepper and Salt to taste.	Beef (lean, without bone), 4 lb. Pepper and Salt to taste. Whey. New Milk, . . . 1 quart. Buttermilk, . . . 1 pint.

Gruel (6 pints).	Arrowroot (¾ pint).	Warm Milk.	Rice Milk (6 pints)
Oatmeal, . 8 oz. Sugar, . 2 oz. Steep the meal from night before, boil for two hours.	New Milk, . 1 pint. Arrowroot, ½ oz. Sugar, . ½ oz.	New Milk, . 3 pints. Boiling Water, 1 pint.	Rice, . 6 oz. Sugar, . 2 oz. New Milk, 6 pints.

Breakfast at Half-past Eight o'clock, Dinner at Half-past One o'clock, Supper at Six o'clock.

Dietary for Nurses and Servants.

Tea, ...	¼ lb. per week.
Sugar, . . .	1 lb. „
Bread, . . .	3 loaves (2 lb. loaves).
Butter, . . .	¾ lb.
Potatoes, . . .	1 lb. daily.
Vegetables, . .	3 times per week.
Meat, . . .	¾ lb. of meat or bacon daily, without bone.
Milk, . . .	1 pint each daily.
Eggs, . . .	2 on Friday for dinner.
Butter, . . .	2 oz. „

Appendix.
No. 7.
Dietaries.

St. Mark's Ophthalmic and Aural Hospital.

Diets.	Breakfast.	Dinner.	Supper.
1. Low Diet, . .	Bread, 4 oz. Tea, 1 pint.	Bread, 4 oz.; new milk, 1 pint. On Friday—Gruel, 1 pint, may be given as a substitute for Dinner Milk.	Bread, 4 oz.; Tea or Cocoa, 1 pint; Whey 1 pint.
2. Ordinary Diet, . Monday, Tuesday, Wednesday, and Saturday.	Bread, 8 oz. Tea, 1 pint.	Bread, 8 oz.; Soup, 1 pint. On Friday—Bread, 8 oz.; Gruel, 1 pint; or Boiled Rice with Sugar and Milk.	Bread, 4 oz.; Tea or Cocoa, 1 Pint.
3. Ordinary Diet, . Sunday and Thursday.	Bread, 8 oz. Tea, 1 pint.	Bread, 8 oz.; or Potatoes, 1 lb.; Beef, Boiled, 8 oz.; or Mutton Chop, Fried; Fresh Vegetables On Friday—Bread, 8 oz.; Gruel, 1 pint; or Boiled Rice with Sugar and Milk.	Bread, 4 oz.; Tea or Cocoa, 1 pint.

Extras allowed (if specially prescribed) with the undermentioned Diets.

1. *Low Diet.*—1 Egg; Beef Tea, 1 pint; or New Milk, 1 pint; or Arrowroot, 1 pint; or Rice Milk, 1 pint; Wine, or Whiskey, or Gin at discretion of Medical Attendant, or Porter; 1 pint.
2. *Ordinary Diet.*—1 Egg; New Milk, 1 pint; Wine, or Whiskey, or Gin at discretion of Medical Attendant; or Porter, 1 pint.
3. *Ordinary Diet.*—1 Egg; New Milk, 1 pint; Wine, or Whiskey, or Gin at discretion of Medical Attendant; or Porter, 1 pint.

The Surgeons may, by a written order in Diet Book, prescribe in special cases, on Fridays, a Mutton Chop in lieu of Dinner Gruel, and Oatmeal Stirabout and New Milk for Breakfast on any day in lieu of Bread and Tea.

Formularies.

Tea (8 pints.)	Beef with Broth (32 pints).	Beef Tea (8 pints).
Tea, . . 2 oz. Sugar, . . 6 oz. New Milk, . 1 pint.	Ox Head, ... 1 Beef, exclusive of bone, 2 oz. to each Patient. } 4 lb. Barley, ... 1 lb. or Split Peas, . . . ½ lb. Oatmeal, . . . 2 lb. Parsley, Thyme, Onions, Leeks or Celery, } to flavour Pepper and Salt to taste. The No. 2 Ordinary Diet Beef to be cut small previous to boiling, and served in the Soup. The No. 3 Ordinary Diet Beef to be served whole.	Beef, lean, without bone, 6 lb. Pepper and Salt to taste. The Beef to be cut small, and placed in cold water for three hours previous to simmering.
Cocoa (8 pints). Soluble Cocoa, . 4 oz. Sugar. . . 6 oz. New Milk, . 1 pint.		

Whey (8 pints)	Gruel (8 pints).	Arrowroot or Rice Milk (1 pint).
New Milk, . . 5 pints. Butter Milk, . . 3 pint.	Oatmeal, . . . 12 oz. Sugar, . . . 6 oz. Ginger to flavour. Steep the meal from night before, boil for two hours.	Arrowroot or Rice, 1 oz. Sugar, . . . ¾ oz. New Milk, . . 1 pint.
	Stirabout (1 quart). Oatmeal, . . . 4 oz. New Milk to be issued with each quart of stirabout. } 1 pint	Dinner Rice. Boiled Rice, (weight uncooked) } 4 oz. Sugar, . . . 1 oz. New Milk, . . ½ pint.

Breakfast at Half-past Seven o'clock, A.M., Dinner at Two o'clock, P.M., Supper at Six o'clock, P.M.

Rotunda Auxiliary Hospital.

Diet.	Breakfast.	Dinner.	Supper.
Full Diet, .	Bread, 4 oz.; Tea, 1 pint; Butter, ½ oz.; or, Bread, 4 oz.; Stirabout, 1 pint; Milk, 1 pint.	4 oz. Cooked Meat, Beef or Mutton, roasted or boiled, alternately; ½ lb. Potatoes; ¼ pint Broth; or, ⅔ pint Broth, with Meat, Rice Pudding, and Bread, 4 oz.; or, 8 oz. White Fish instead of Broth.	Bread, 6 oz.; Tea, 1 pint; or, Bread, 4 oz., and 1 pint of Gruel; or, 1 pint Stirabout and ½ pint Milk.
Low Diet, .	Bread, 4 oz.; Milk, Tea, or Gruel, 1 pint; Butter, ½ oz.	Bread, 4 oz.; Milk or Beef Tea, 1 pint.	Same as Breakfast.
Fever Diet, .	Milk, Whey, Beef Tea, Chicken Broth, Stimulants, Bread, Arrowroot, Sago, or Corn Flour, as ordered.		

Maternity Hospital.

Low Diet.—2 pints hot Milk, 1 pint Gruel, 1 pint Broth. Tea, Bread, a sufficiency. Beef Tea, Eggs, or other extras when ordered.

Full Diet.—6 oz. meat in place of Broth.

For Beef Tea we allow ¾ lb. beef to 1 pint water. For Broth—Stock with barley, oatmeal, Herbs, &c. For Gruel—To 7 pints Milk, 1 lb. Oatmeal, 4 oz. Sugar, and a little Ginger. Tea, 1 oz. for 6 patients.

Each patient on admission shall be placed on Low Diet, until the proper Diet is ordered, or by the Physicians. No extra shall be given, unless on the order of the Master or Assistants, nor re-issued unless the order therefor is initialed on the Diet Sheet by the Physician at his regular visit.

Royal Hospital for Incurables, Donnybrook.

Dietary (Full).

Monday,* . . ⅔ lb. Potatoes, 3¼ oz. Tea, ¾ lb. Sugar, 6 oz. Bacon, Cabbage, 1 lb. Bread, ½ pint Milk.

Tuesday, . . ⅔ lb. Potatoes, 3 oz. Butter, 8 oz. Mutton, 1 lb. Bread, ½ pint Milk.

Wednesday, . ⅔ lb. Potatoes, ½ lb. Beef, 1 lb. Bread, ½ pint Milk.

Thursday, . ⅔ lb. Potatoes, 6 oz. Bacon, Cabbage, 1 lb. Bread, ½ pint Milk.

Friday, . . ⅔ lb. Potatoes, Fish, 3 oz. Butter, 1 lb. Bread, ½ pint Milk.

Saturday, . . ⅔ lb. Potatoes, ½ lb. Beef, 1 lb. Bread, ½ pint Milk, 1 pint Soup.

Sunday, . . ⅔ lb. Potatoes, 8 oz. Mutton, 1 lb. Bread, ½ pint Milk.

Dietary (Invalid).

Monday,* . . ⅔ lb. Potatoes, 3¼ oz. Tea, ¾ lb. Sugar, 6 oz. Bacon, Cabbage, ½ lb. Bread, ½ pint Milk.

Tuesday, . . ⅔ lb. Potatoes, 2 Eggs for Dinner, 3 oz. Butter, ½ lb. Bread, ½ pint Milk.

Wednesday, . ⅔ lb. Potatoes, 6 oz. Mutton, ½ lb. Bread, ½ pint Milk.

Thursday, . . ⅔ lb. Potatoes, 6 oz. Bacon, Cabbage, ½ lb. Bread, ½ pint Milk.

Friday, . . ⅔ lb. Potatoes, Fish, 3 oz. Butter, ½ lb. Bread, ½ pint Milk.

Saturday, . . ⅔ lb. Potatoes, 2 Eggs for Dinner, ½ lb. Bread, ½ pint Milk.

Sunday, . . ⅔ lb. Potatoes, 6 oz. Mutton, ½ lb. Bread, ½ pint Milk.

* Week's Tea and Sugar.

Appendix.

No. 8.

Governors, Westmorland Lock Hospital.

No. 8.

Westmorland Lock (Government) Hospital.

Board of Governors.

Appointed by His Excellency the Lord Lieutenant.

(19 & 20 Vic., cap. 110.)

Date of Appointment.	Members' Names.
1870, May 21st,	Edward Fottrell, esq., J.P.
1877, January 5th,	Sir George B. Owens, Knt., M.D., J.P.
1879, February 8th,	Sir Philip Crampton Smyly, M.D., F.R.C.S.I.
1880, January 31st,	John R. Mallins, esq., J.P.
1880, November 30th,	Francis R. Cruise, esq., M.D., F.R.C.P.I.
1883, December 5th,	Sir George H. Porter, Bart., M.D., F.R.C.S.I., J.P., D.L.
1884, May 20th,	William Findlater, esq., A.M. D.L.,
1885, June 12th,	Richard O'Shaughnessy, esq., B.L.
1888, February 21st,	John E. Barry, esq.
1888, February 21st,	Alderman Sir Robert Sexton, Knight, J.P., D.L.
1889, March 16th,	Charles Kennedy, esq., J.P.
1890, June 23rd,	George Plunkett O'Farrell, esq., M.D., M.R.C.S., Eng., J.P.
1890, March 7th,	Lambert Hepenstal Ormsby, esq., M.D., F.R.C.S.I., J.P.
1892, July 1st,	William P. O'Brien, esq., C.B.
1890, December 31st,	Stewart Woodhouse, esq , M.D., F.R.C.S.I.
1892, July 11th,	John Ormond Masterson, esq,
1892, July 11th,	William Watson, esq., J.P.
1892, July 11th,	Colonel A. Vesey Davoren, J.P.
1893, January 25th,	Charles E. Lambkin, esq.
———	George H. Kidd, esq., M.D.

James Wilson Hughes,
Registrar.

30*th April*, 1895.

Westmorland Lock Government Hospital.

Return showing the Attendance of each Member of the Board of Governors at the several Meetings held during the Year ended 31st March, 1895.

Number of Board Meetings held.	Number of Committee Meetings held.	Date of Meeting, 1892–93.	1. Edward Fottrell, J.P.	2. Sir G. Owens, M.D., J.P.	3. Sir Philip C. Smyly, M.D.	4. John R. Mallins, J.P.	5. Fras. R. Cruise, M.D.	6. Sir Geo. H. Porter, M.D.	7. William Findlater, D.L.	8. Richard O'Shaughnessy, B.L.	9. John E. Barry.	10. Sir Robt. Sexton, D.L.	11. Charles Kennedy, J.P.	12. Lambert H. Ormsby, M.D., J.P.	13. Geo. Plunkett O'Farrell, M.D., J.P.	14. Stewart Woodhouse, M.D.	15. W. P. O'Brien, C.B.	16. John O. Mesterson.	17. William Watson, J.P.	18. Colonel A. Vesey Davoren, D.L.	19. Charles E. Lambkin.	20. Geo. H. Kidd, M.D.	Total Governors present at Board Meetings.	Observations.
		1894.																						
1	–	April, . . 7,	1	1	–	–	1	1	–	1	–	1	1	1	1	1	–	–	–	1	1	–	12	
2	–	,, . . 12,	1	1	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	4	
3	–	May, . . . 5,	1	1	–	–	1	1	1	–	1	1	1	1	–	1	1	1	–	1	1	–	14	
4	–	,, . . . 12,	1	1	1	–	1	1	–	1	1	1	1	1	1	1	1	–	–	1	1	1	17	
5	–	June, . . 2,	1	1	–	–	–	1	1	–	1	1	1	1	1	1	1	–	–	–	–	–	11	
6	–	July, . . . 7,	1	1	–	–	–	1	–	–	–	–	–	1	–	1	1	–	–	–	1	1	9	
7	–	August, . . 4,	1	1	–	1	–	–	–	–	–	–	1	–	–	–	1	–	–	1	–	–	6	
8	–	September, . 1,	1	1	–	–	–	–	1	1	–	–	1	1	–	1	–	–	–	–	1	–	9	
9	–	October, . . 6,	1	1	–	1	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	6	
10	–	November, . 3,	1	1	–	–	–	1	1	–	1	–	1	1	–	1	–	–	–	–	1	–	10	
11	–	December, . 1,	1	1	–	1	–	–	1	1	–	–	1	1	–	–	–	–	–	–	–	–	7	
		1895.																						
12	–	January, . . 5,	1	1	–	1	–	–	1	1	–	1	–	1	–	1	–	1	–	–	1	–	10	
13	–	February, . . 2,	1	1	–	–	–	–	1	–	1	1	1	1	–	–	–	1	–	–	1	–	9	
14	–	March, . . 2,	1	1	–	–	–	–	1	–	1	1	–	1	–	–	–	1	–	–	–	–	7	
		Total, . .	14	14	1	4	3	6	8	6	6	9	9	12	3	9	2	11	–	4	8	2	131	

Westmorland Lock Government Hospital,
May, 1895.

(Certified), J. W. Hughes, *Registrar.*

Appendix.

No. 8.

Governors, House of Industry Hospitals.

House of Industry (Government) Hospitals.

Board of Governors.

Appointed by His Excellency the Lord Lieutenant.
(19 & 20 *Vic.*, *Cap.* 110.)

1. The Right Hon. the Earl of Meath, Chairman.
2. Charles E. Martin, esq., J.P.
3. Sir William Stokes, M.D., F.R.C.S.I.
4. John R. Mallins, esq.
5. Sir John Banks, K.C.B., M.D.
6. Sir Percy R. Grace, Bart., J.P., D.L.
7. Patrick Martin, esq., Q.C.
8. Samuel Gordon, esq., M.D.
9. William Thomson, esq., M.D., F.R.C.S.I.
10. Right Hon. Joseph M. Meade, P.C.
11. Right Hon. Thomas A. Dickson, P.C.
12. James Murphy, esq.

James Wilson Hughes, *Secretary and Superintendent.*

Return showing the Attendance of each Member of the Board of Governors at the several Meetings held during the Year ended 31st March, 1895.

Number.	Date of Meeting, 1894–95.	1. Right Hon. Earl of Meath.	2. Charles E. Martin, esq. J.P.	3. Sir William Stokes, M.D., F.R.C.S.I.	4. John R. Mallins, esq.	5. Sir John Banks, K.C.B., M.D.	6. Sir Percy R. Grace, Bart., J.P., D.L.	7. Patrick Martin, esq., Q.C.	8. Samuel Gordon, esq., M.D.	9. William Thomson, esq., M.D., F.R.C.S.I.	10. Right Hon. Joseph M. Meade, P.C.	11. Right Hon. Thos. A. Dickson, P.C.	12. James Murphy, esq.	Total Governors present.
	1894.													
1	April, . . . 5,	–	–	–	–	1	1	–	1	1	–	–	–	4
2	„ . . . 12,	–	1	–	–	1	1	–	1	–	–	1	–	5
3	„ . . . 21,	–	1	–	–	1	–	–	1	–	–	1	–	4
4	„ . . . 26,	–	–	–	–	1	–	–	1	1	–	1	–	4
5	May, . . . 3,	–	–	1	–	1	–	–	1	1	–	1	–	5
6	„ . . . 10,	–	1	–	–	1	–	–	1	1	–	–	–	4
7	„ . . . 17,	–	1	1	–	–	–	–	1	1	–	1	–	5
8	„ . . . 24,	–	–	–	–	–	–	–	1	1	–	1	–	3
9	„ . . . 31,	–	1	–	–	–	–	–	1	1	1	–	1	5
10	June, . . . 2,	–	–	1	–	1	–	–	1	1	–	1	–	5
11	„ . . . 7,	–	–	1	–	1	–	–	1	1	–	1	–	5
12	„ . . . 14,	–	–	–	–	1	–	–	1	1	–	–	–	3
13	„ . . . 21,	–	–	–	–	1	–	–	1	1	–	–	–	3
14	„ . . . 28,	–	–	1	–	–	–	–	1	1	–	1	–	4
15	July, . . . 5,	–	–	1	–	1	1	1	1	1	1	1	–	8
16	„ . . . 10,	–	–	–	–	1	–	–	1	1	1	1	–	5
17	„ . . . 12,	–	1	1	–	1	–	–	1	1	1	1	–	7
18	„ . . . 19,	–	–	–	1	1	–	–	1	1	–	–	–	4
19	„ . . . 26,	–	–	–	–	–	–	–	1	1	–	–	–	2
20	August, . . 2,	–	–	–	–	–	–	–	1	1	–	–	–	2
21	„ . . . 9,	–	1	1	–	–	1	1	1	1	–	–	–	6
22	„ . . . 16,	–	–	–	–	–	–	–	1	1	–	–	–	2

RETURN showing the Attendance of each Member of the Board of Governors at the several Meetings held during the Year ended 31st March, 1895—*continued.*

Number.	Date of Meetings, 1894-95.	1. Right Hon. Earl of Meath.	2. Charles E. Martin, esq., J.P.	3. Sir William Stokes, M.D., F.R.C.S.I.	4. John R. Mallins, esq.	5. Sir John Banks, K.C.B., M.D.	6. Sir Percy R. Grace, J.P., Bart., D.L.	7. Patrick Martin, esq., Q.C.	8. Samuel Gordon, esq., M.D.	9. William Thomson, esq., M.D., F.R.C.S.I.	10. Right Hon. Joseph M. Meade, P.C.	11. Right Hon. Thos. A. Dickson, P.C.	12. James Murphy, esq.	Total Governors present.
	1894.													
23	August, . . 23,	–	–	1	–	1	–	–	1	–	–	–	–	3
24	„ . . 30,	–	–	–	–	1	–	–	1	–	–	–	–	2
25	September, . 6,	–	–	–	–	–	–	–	1	–	–	–	–	1
26	„ . . 13,	–	–	–	1	–	–	–	1	1	–	–	–	3
27	„ . . 20,	–	–	–	1	–	–	–	1	1	–	–	–	3
28	„ . . 27,	–	–	–	1	1	–	–	1	1	–	–	–	4
29	October, . . 4,	–	–	–	–	1	–	–	1	1	–	–	–	3
30	„ . . 11,	–	–	1	–	1	–	–	1	1	–	–	–	4
31	„ . . 18,	–	–	1	–	1	1	1	1	1	–	–	–	6
32	„ . . 25,	–	1	1	–	1	–	–	1	–	–	–	–	4
33	November, . 1,	–	–	–	–	1	–	–	1	1	–	–	–	3
34	„ . . 8,	–	–	–	–	1	–	–	1	1	–	–	–	3
35	„ . . 15,	–	1	–	–	1	1	1	1	1	1	–	–	7
36	„ . . 20,	–	1	–	–	1	–	–	1	1	–	–	–	4
37	„ . . 22,	–	–	–	–	1	–	1	1	1	–	1	–	5
38	„ . . 29,	–	–	1	–	–	1	–	1	1	–	–	–	4
39	December, . . 6,	–	–	–	–	1	–	1	1	1	–	1	–	5
40	„ . . 13,	–	–	1	–	1	1	1	1	1	1	1	1	9
41	„ . . 18,	–	–	–	–	–	–	1	1	1	–	–	–	3
42	„ . . 20,	–	–	–	–	1	–	1	1	1	–	–	1	5
43	„ . . 27,	–	–	–	–	1	–	1	1	1	–	1	–	5
	1895.													
44	January, . . 3,	–	1	–	–	1	–	–	1	1	–	1	–	5
45	„ . . 10,	–	–	–	–	1	–	–	1	1	–	–	–	3
46	„ . . 17,	–	1	1	–	1	–	1	1	1	–	1	–	7
47	„ . . 24,	–	–	–	–	1	1	–	1	1	–	–	–	4
48	„ . . 31,	–	–	1	–	–	–	1	1	1	–	1	–	5
49	February, . . 14,	–	–	–	–	1	–	1	1	–	–	–	–	3
50	„ . . 28,	–	1	1	–	1	1	–	1	1	–	1	–	7
51	March, . . 14,	–	–	–	–	1	1	–	1	1	–	–	–	4
	Total individual attendances, . .	–	13	17	4	37	11	13	51	44	6	20	3	219
	Average number present at meetings, .	–	–	–	–	–	–	–	–	–	–	–	–	4·29

Appendix. No. 8.

Attendance, Steevens's Hospital.

RETURN of ATTENDANCES of COMMITTEE of DR. STEEVENS'S HOSPITAL for Year ended March 31st, 1895.

No.	Name.	No. of Attendances.	No.	Name.	No. of Attendances.
1	The Dean of St. Patrick's,	9	5	H. C. Tweedy, esq., M.D.	22
2	Sir Ralph Cusack, D.L.	1	6	Francis B. Ormsby, esq.	21
3	T. W. Grimshaw, esq., Reg. General,	11	7	William Millar, esq.,	17
4	Edward Hamilton, esq., F.R.C.S.,	21	8	Joshua J. Pim, esq., J.P.,	2
				Total,	104

Committee, Meath Hospital.

LIST of NAMES of the STANDING COMMITTEE of the MEATH HOSPITAL for the Year ended 31st March, 1895, and the Number of Attendances of each Member at the Board Meetings, for that period.

No.	Names.	No. of Attendances.	No.	Names.	No. of Attendances.
1	The Viscount Powerscourt, K.P.	–	14	William M'Comas, esq. J.P (the late),	2
2	Arthur Andrews, esq., J.P.	14	15	Richard F. M'Coy, esq., T.C.	3
3	George F. Brooke, esq., D.L.	–	16	L. Hepenstal Ormsby, esq., F.R.C.S., J.P.	24
4	Vere Ward Brown, esq.	23	17	Sir George B. Owens, M.D., J.P.	17
5	John V. Cassidy, esq., J.P.	12	18	George Perry, esq., J.P.	9
6	Richard J. Corballis, esq., J.P.	9	19	Sir George Porter, Bart., LL.D, D.L., Surgeon to the Queen,	4
7	Colonel G. R. Dease, J.P.	–	20	William Henry Porter, esq., M.A.	4
8	Sir Percy R. Grace, Bart., D.L.	10	21	Sir Philip C. Smyly, F.R.C.S.	11
9	Sir Howard Grubb, F.R.S.,	–			
10	Rt. Hon. Ion Trant Hamilton, P.C., H.M.L. County Dublin,	1		Number of meetings, 24	190
11	Saml. E. Hamilton, esq., J.P.	15			
12	John Hatchell, esq., M.A., D.L.	10		Average number at each meeting,	7·91
13	John William Moore, esq., M.D.	22			

Committee, Cork-street Fever Hospital.

MANAGING COMMITTEE of CORK-STREET FEVER HOSPITAL, and Number of Attendances.

No.	Names.	No. of Attendances.	No.	Names.	No. of Attendances.
1	William Jameson, J.P.,	–	11	J. J. Digges La Touche,	39
2	Abraham Shackleton,	49	12	J. D. Fisher	43
3	Thomas P. Hogg,	–			
4	Nicholas Lynch,	29		No. of Meetings,	47
5	Edmund J. Figgis,	–			
6	John D. Wardell,	–		No Quorum,	4
7	George Drury,	33			
8	William Perrin,	2		Special Meetings,	3
9	Alderman M. Kernan,	–			
10	Marcus Goodbody, J.P.	30		Total,	54

Appendix.
No. 8.
Attendance, Lying-in Hospital.

List of Governors and Statement of Attendances at the Lying-in Hospital, Dublin, for the Year ended 31st March, 1895.

GOVERNORS AND GUARDIANS.

President:

* His Excellency the Lord Lieutenant.

No.	Names.	No. of Attendances.			No.	Names.	No. of Attendances.		
		Board	House Com.	Build. Com.			Board	House Com.	Build. Com.
	Vice-Presidents:				27	Charles G. Stanuell, Esq.,	–	–	–
					28	A. Traill, Esq.,	–	–	–
1	The Lord Chancellor,	–	–	–	29	Lombe Atthill, Esq., M.D.,	5	–	–
2	The Archbishop of Dublin,	1	–	–	30	John Jameson, Esq.,	–	–	–
3	Samuel F. Adair, Esq., J.P.,	10	9	8	31	R. Grant Pilkington, Esq.,	12	–	–
4	The Lord Ardilaun,	–	–	–	32	J. Hogg, Esq.,	4	–	–
5	Sir R. S. Cusack, D.L.,	–	–	–	33	James Little, Esq., M.D.,	–	–	–
6	Hon. Vice-Chancellor,	3	–	–	34	Francis T. D. Longworth, Esq.,	–	–	–
					35	W. G. Wybrants, Esq.,	9	–	–
7	His Grace Lord Primate,	–	–	–	36	Thomas Greene, Esq.,	8	–	
8	The Right Hon. The Lord Mayor,	1	–	–	37	Sir P. R. Grace, Bart.,	4	1	–
9	The Commander of the Forces,	–	–	–	38	Robert S. Reeves, Esq.,	11	11	8
10	Very Rev. Dean of St. Patrick's,	–	–	–	39	R. S. Chatterton, Esq.,	3	–	–
11	Ven. Archdeacon of Dublin,	–	–	–	40	William Watson, Esq.,	7	–	–
12	The High Sheriff of Dublin,	–	–	–	41	Joseph Wilson, Esq.,	2	–	–
13	The Recorder of Dublin,	2	–	–	42	M. T. Moses, Esq.,	8	–	–
14	William Foot, Esq.,	–	–	–	43	George V. Hart, Esq.,	1	–	–
15	Thomas J. White, Esq.,	–	–	–	44	W. Findlater, Esq.,	4	–	–
16	J. A. Hamilton, Esq.,	–	–	–	45	A. McMahon, Esq.,	8	–	–
17	Chaworth J. Ferguson, Esq.,	–	–	–	46	G. B. Thompson, Esq.,	3	–	–
18	Edward Geale, Esq.	1	–	–	47	James Murphy, Esq.,	7	4	2
19	Robert W. Shekleton, Esq.,	6	–	–	48	Henry Dudgeon, Esq.,	5	5	4
20	John Maunsell, Esq.,	–	–	–	49	William J. Smyly, Esq., M.D. (Master),	8	9	6
21	S. Holt Close, Esq.,	–	–	–	50	Charles E. Martin, Esq.,	1	–	2
22	Henry Watson, Esq.,	–	–	–	51	John R. Orpen, Esq.,	9	3	4
23	C. Uniacke Townshend, Esq.,	4	–	–	52	John Murphy, Esq.,	–	–	–
24	F. L. Tottenham, Esq.,	–	–	–	53	William J. Goulding, Esq.,	4	–	
25	R. O'B. Furlong, Esq.,	9	–	–	54	Wellington Darley, Esq.,	2	–	2
26	R. O. Armstrong, Esq.,	–	–	–	55	Alexander Knox M'Entire, Esq.,	5	–	5
					56	Master Courtenay,	3	–	–
					57	Andrew Jameson, Esq.,	–	–	–
					58	Joseph Hone, Esq.,	–	–	
					59	Duke of Leinster,	–		–

Master of the Hospital.—W. J. Smyly, M.D., elected November 1st, 1889.
Consulting Physician.—James Little, M.D., F.R.C.P.
Consulting Surgeon.—Sir George Hornidge Porter, Bart., D.L.
Assistant Physicians.—Henry Wilson, L.R.C.S.I., L. & L.M.R.C.P.I., L.M. Rotunda Hospital; E. Hastings Tweedy, M.R.C.P., L.R.C.S.I., L.R.Q.C.P.I., L.M. Rotunda Hospital.
Lady Superintendent.—Miss Sarah E. Hampson.
Chaplain.—Rev. J. O. Gage Dougherty, M.A.
Treasurer.—The Bank of Ireland.
Secretary and Registrar.—Wyndham-Quin Fitzgerald.

Return of Names of the Guardians and Directors of the Coombe Lying-in Hospital, With the Dates of Meetings, Attendances, &c., during the Year ended 31st March, 1895.

The House Committee Meetings are marked thus (*)

List of Guardians and Directors.	1894.																						1895.						Total Board Meetings.	Total House Committee Meetings.	Grand Total.
	*April 12.	April 26	*May 17.	May 31.	June 14.	June 21.	June 28.	July 5.	*July 12.	July 16.	July 20.	July 26.	*Aug. 9.	Aug. 30.	*Sept. 13.	Sept. 27.	*Oct. 11.	Oct. 29.	*Nov. 8.	Nov. 29.	*Dec. 13.	Dec. 27.	*Jan. 10.	Jan. 31.	Feb. 14.	Feb. 28.	*March 14.	March 28.			
1 The Right Hon. the Lord Mayor of the City of Dublin (*Chairman*),	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	1	–	1
2 The High Sheriff of the City of Dublin (*Vice-Chairman*),	–	–	–	1		–	–	–	–	1	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	4	–	4
3 Frederic Wm. Kidd, esq., M.D. (*Master*),	1	1	–	1	1	1	1	1	1	1	1	1	1	–	–	1	1	1	1	1	1	–	1	1	–	1	1	1	15	8	23
4 The Right Hon. Lord Ardilaun, D.L.,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–	1
5 Jas. Fitzgerald Lombard, esq., J.P. (*Hon. Sec.*),	–	1	1	–	1	–	1	1	1	1	1	–	–	1	–	1	1	1	1	1	1	1	1	1	1	–	–	1	12	7	19
6 Edward Fottrell, esq., J.P.,	–	–	–	1	1	1	1	1	–	1	1	–	–	1	–	–	–	1	–	1	–	–	–	–	–	–	–	1	11	–	11
7 John Summers, esq.,	–	1	–	1	1	1	1	1	–		1	1	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	10	–	10
8 Sir Charles A. Cameron, M.D.,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
9 John Fox Goodman, esq., M.A., J.P.,	1	–	–	1	1	1	1	–	1	–	1	1	–	1	–	–	1	1	–	1	–	1	–	1	–	–	–	–	11	3	14
10 George H. Kidd, esq., M.D. (*Ex-Master*),	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	2	1	3
11 Sir John Banks, M.D., K.C.B.,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
12 The Very Rev. Canon Daniel, P.P.,†	1	1	–	–	–	1	–	1	–	1	1	1	1	1	1	1	–	1	1	1	1	1	1	1	1	1	1	–	13	8	21
13 Rev. J. Dryden Smylie, M.A.,	–	1	–	–	–	1	1	–	–	–	–	–	–	–	–	–	1	1	–	1	–	–	–	–	–	–	–	–	5	1	6
14 Alderman Kernan,	–	–	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
15 Robert Callow, esq., J.P.,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
16 The Right Hon. the Earl of Meath,	–	–	–	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
17 John Fleming, esq., J.P.,	–	–	–	1	1	1	1	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–	6
18 William M. Murphy, esq., J.P., C.E.,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
19 Samuel R. Mason, esq., M.D. (*Ex-Master*),	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–	1
20 George Perry, esq. J.P.,	–	–	–	1	–	1	1	–	–	1	–	1	–	1	–	1	–	1	–	1	–	–	–	1	–	–	–	1	11	–	11
21 John C. Parkes, esq. (Elected April 26, 1894),	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1	–	1
Total,	3	5	1	7	6	8	7	8	3	8	7	5	2	5	1	5	4	7	4	10	5	3	3	6	2	2	2	4	104	28	132

† Died 7th April, 1895.

Appendix.
No. 8.
Governors, St. Mark's Hospital.

St. Mark's Ophthalmic Hospital and Dispensary for Diseases of the Eye and Ear.

Year ending 31st March, 1895.

Board of Governors.

The Right Hon. the Lord Mayor [for the time being, during his term of office].
*James Fitzgerald Lombard, Esq., J.P.
Rev. Samuel Haughton, M.D., S.F.T.C.D
Rev. Abraham Stritch Fuller, D.D.
Sir George Hornidge Porter, Bart., J.P., D.L.
*John B. Story, Esq., M.B., M.CH., F.R.C.S.I.
James Little, Esq., M.D., F.R.C.P.I.
John Robert Mallins, Esq., J.P.
Sir Percy Raymond Grace, Bart., J.P., D.L.
William J. Goulding, Esq., M.A., J.P., D.L.
*Hamilton Drummond, Esq.
*Augustine F. Baker, Esq.
Michael J. Losty, Esq., T.C.

(Thus marked * are Trustees.)

Building Committee.
J. F. Lombard, Esq.
J. B. Story, Esq.
J. R. Mallins, Esq.

Finance Committee.
J. F. Lombard, Esq.
J. B. Story, Esq.
J. R. Mallins, Esq.
Sir Percy R. Grace.
Hamilton Drummond, Esq,
Rev. Dr. Haughton.

Hon. Secretary.—Augustine F. Baker, Esq.
Hon. Treasurer.—James F. Lombard, Esq.
Registrar.—W. G. T. Story, M.B. *Collector.*—S. H. Caithness.
Bankers.—The Royal Bank of Ireland, Foster-place, Dublin;
The Bank of Ireland, Dublin.

Attendance of Governors at the Meetings of the Board, held during the year ended 31st March, 1895.

Name.	No. of Attendances.	Name.	No. of Attendances.
The Lord Mayor,	1	J. R. Mallins, Esq.,	8
J. F. Lombard, Esq.,	7	Sir Percy R. Grace,	8
Rev. Samuel Haughton,	4	W. J. Goulding, Esq.,	4
Rev. A. S. Fuller,	4	Hamilton Drummond, Esq.,	8
Sir G. H. Porter,	–	A. F. Baker, Esq.,	7
J. B. Story, Esq., F.R.C.S.,	13	M. J. Losty, Esq.,	3
James Little, Esq., M.D.,	1		

Total number of Board Meetings held was 13.

The Finance Committee met 12 times.

Name.	No. of Attendances.	Name.	No. of Attendances.
J. B. Story,	12	Sir Percy Grace,	1
J. F. Lombard,	3	Hamilton Drummond,	3
J. R. Mallins,	11	Rev. Dr. Haughton,	-

W. G. Story, *Registrar.*

Appendix.

No. 8.

Governors, Hospital for Incurables.

Royal Hospital for Incurables.

Attendances of Governors.

Name.	No. of Attendances.	Name.	No. of Attendances.
Adair, Samuel F., J.P.	7	Fox, Miss Annie	7
Adair, Mrs. S. F.	6	Fry, William	10
		Fry, William, junr., J.P.	6
		Fry, Miss Mary L.	7
Bannon, Michael	1	Fry, Oliver	2
Barton, Henry M.	2		
Beater, Orlando	7		
Beater, Orlando P., M.D.	6	Galbraith, Hugh	8
Bentley, John, J.P.	2	Garratt, Wm. A.	1
Bermingham, P. T.	6	Geoghegan, W. J.	1
Bradshaw, Rev. Macnevin	1	Gilmore, John	8
Brady, Terence	2	Gleeson, P. M.	1
Brown, Hugh D.	1	Glennon, Joseph	1
Brown, Vere Ward	9	Good, Rev. Thomas, B.D.	10
Brown, Mrs.	6	Goodfellow, John S.	6
Burroughs, Rev. W. E., B.D.	6	Goodlatte, E. R.	2
		Gregg, Miss F.	2
Carey, Richard	7		
Carolin, George O., J.P.	7	Haliday, Miss A. R.	1
Carolin, Miss Ida	3	Hamilton, Samuel E., J.P.	3
Carroll, J. Rawson, F.R.I.B.A.	8	Harding, Falkiner	3
Casson, George W., J.P.	7	Hatchell, John, D.L	1
Casson, Mrs. G. W.	1	Hayes, William	6
Caulfield, Rev. F. Montgomerie	1	Hewat, William,	1
Cochrane, Sir Henry, J.P.	2	Hewat, Mrs.	1
Corballis, R. J.	2	Hodgson E. M.	1
Corcoran, Miss K.	8	Hogg, Jonathan	3
Cranny, John Joseph, M.D.	12	Hone, Joseph	3
Curtis, Thomas, J.P.	7	Horris, Very Rev. Canon	6
Daniel, Very Rev. Canon (the late)	2	Jephson, Robert H.	3
		Johnson, Mrs.	1
Dillon, Right Hon. V. B. Lord Mayor.	1	Johnston, Henry, C.E.	8
		Johnston, Francis	1
Dillon, Michael	4	Jones, Miss Elizabeth	2
Dillon, Miss Louisa	8		
Doolin, Mrs. Walter	1		
Drummond, David, J.P.	10	Kane, His Honor Judge	4
Drummond, Hamilton	2	Kelly, Thomas A.	6
Drum, Thomas	9	Kennedy, Charles	2
Drury, J. Girdwood, J.P.	1	Kennedy, James	6
Duncan, James F. M.D. (the late).	1	Kennedy, Louis,	4
		Kennedy, Francis	4
Egan, Mrs. Edward D.	1		
Eves, Graves S.	8	Law, T. Pakenham, Q.C.	4
		Law, Mrs. T. P.	2
		Law, Miss H. H.	3
Farrell, Thomas A., J.P.	2	Lawler, Charles, J.P.	1
Farrell, Hon. Mrs. Thomas A.	1	Lentaigne, John, F.R.C.S.	5
Figgis, E. J.	12	Long, Edmond	4
Findlater, John, J.P.	1	Lynch, Nicholas	3
Findlater, William, D.L.	7	Lynch, Mrs.	3
Fitzgerald, Thomas	9	Lynch, P.	1
Fitzgerald, Miss Minnie	6		
Fleming, John, J.P.	3		
Fottrell, Edward, J.P.	11	M'Cabe, Miss Kate	7
Fottrell, Miss Mary J.	8	M'Cann, James, J.P.	1
Fottrell, John George	2	M'Comas, Samuel, J.P.	5

Royal Hospital for Incurables.

Attendances of Governors—*con.*

Name.	No. of Attendances.	Name.	No. of Attendances
M'Comas, William, J.P. (the late).	1	Richardson, Robert Delap	1
M'Donald, James	4	Rorke, Miss	7
M'Vittie, R. Blake, M.D.	4	Ryland, Mrs.	4
Mapother, E. D., M.D.,	1		
Martin, Miss K.	4	Searight, Graves E.	7
Merry, James A.	4	Sexton, Alfred R., J.P.,	5
Mitchell, Mrs. Alfred	9	Shelton, Mrs. B.	2
Molloy, William R., M.R.I.A.	4	Sibthorpe, Thomas S., J.P.	8
Montgomery, Robert, M.D.	4	Smalldridge, Samuel, J.P.	1
Mooney, Mrs. Edmund	1	Smith, Mrs.	6
Mooney, John	6	Smith, Mrs. George R.	1
Moses, Marcus Tertius	6	Smyth, Robert W.	1
Mulligan, John	2	Sykes, James R.	2
Murphy, Michael	1		
Murphy, Miss Mary	4		
		Thrift, H. G.	2
		Townshend, C. Uniacke, J.P.	5
Neligan, Rev. Canon, D.D.	8	Trouton, C. R.	5
		Truell, H. P., M.B., F.R.C.S.I.	3
O'Brien, Miss	8		
O'Connor, Hugh	9		
Owens, Sir George B., M.D., J.P.	8	Vernon, Fane, J.P.	5
		Vernon, Mrs. Fane	4
Parkes, J. C.	1		
Parkes, John	7	Wade, G. Rochfort	6
Perceval, Miss	2	Wade, Mrs. G. R.	6
Pigot, Thomas F.	2	Wade, Miss Fanny M.	3
Pim, James	1	Walsh, Rev. Canon, D.D.	4
Power, James Talbot, D.L.	1	Wardell, John D.	1
Purser, W. E.	3	Watson, William	11
		Wheeler, W. Ireland, M.D., F.R.C.S.I.	1
Radcliffe, Miss S. Weekes	4	White, W. Grove, LL.B.	4
Read, Edward R.	3	White, Mrs. W. G.	1
Reid, J. Hamilton	2	Winter, Miss M.	5

Thomas Edward Grey,

Registrar.

No. 10,458.

Dublin Castle,
21st June, 1895.

Sir,

I have to acknowledge the receipt of your letter of the 13th instant, forwarding, for submission to His Excellency the Lord Lieutenant, the Report of the Board of Superintendence of the Dublin Hospitals for the year ended 31st March, 1895.

I am, Sir,

Your obedient Servant,

D. HARREL.

W. J. Martin, Esq., M.D.,
Secretary,
35, Dawson-street,
Dublin.

DUBLIN: Printed for Her Majesty's Stationery Office,
By ALEX. THOM & CO. (Limited), 87, 88, & 89, Abbey-street,
The Queen's Printing Office.

NATIONAL GALLERY.

RETURN to an Order of the Honourable The House of Commons, dated 1 April 1895;—*for*,

COPY "of the ANNUAL REPORT of the DIRECTOR OF THE NATIONAL GALLERY to the TREASURY, for the Year 1894."

Treasury Chambers,
28 March 1895.

JOHN T. HIBBERT.

(*Sir John Hibbert.*)

Ordered, by The House of Commons, *to be Printed*,
1 *April* 1895.

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REPORT.

National Gallery, London,
4 January 1895.

My Lords,

I HAVE the honour to submit to your Lordships the following Report on the National Gallery for the year 1894:—

The present Trustees are, in the order of their nomination,—

The Earl of Carlisle.	John P. Heseltine, Esq.
The Right Hon. Lord Savile, G.C.B.	The Marquess of Lansdowne, K.G., and
Alfred C. de Rothschild, Esq.	Sir Charles Tennant, Bart.

(*See* Treasury Letter, dated 13th September 1894.)

The subjects of the Report are,—

I.—Pictures purchased during the Year.

II.—Bequests and Donations to the Gallery.

III.—Loans to Provincial Institutions.

IV.—Details relating to the Gallery and Establishment.

I.—PICTURES PURCHASED DURING THE YEAR.

(A. Purchased out of a Parliamentary Grant in Aid and a Special Vote.)

1. "Portrait of a Gentleman," by Gerard Terborch.
2. "Christ before Pilate," by Rembrandt van Rÿn.
3. "A study of Still Life," by Pieter Snyers.
4. "A Laundry Maid," by Henry R. Morland.
5. "A Laundry Maid," by Henry R. Morland.
6. "The Annunciation," by Fra Giovanni Angelico.
7. "Pegwell Bay, Kent," by William Dyce, R.A.
8. "The Mystic Marriage of St. Catherine," by Andrea Cordelle Agii.
9. "The Virgin and Child," by Ambrogio Borgognone.
10. "The Adoration of the Shepherds"—"The dead Christ" (a diptych), by Ercole de' Roberti.
11. "The Virgin and Child with the Infant St. John," by Filippino Lippi.
12. "Supposed Portrait of Anna Maria van Schurman," by Gerard Dou.
13. "The Agony in the Garden," by Andrea Mantegna.
14. "St. Jerome in his Study," by Antonello da Messina.
15. "The Legend of St. Giles," Flemish School.
16. "A view in Haarlem," by Gerrit A. Berck-Heyde.
17. "A Terrace scene, with Figures," by Jan Steen.
18. "View of the Rotunda at Ranelagh," by Antonio Canale.
19. "The Baptism of Our Lord," by Pietro Perugino.

(B. Purchased out of the "Lewis Fund.")

20. "The Virgin and Child with two Saints," by Filippo Mazzola.
21. "The dead Christ—a Pietà," by Hans Baldung.
22. "View of the Quay at Southampton," by R. H. Lancaster.

(C. Purchased out of the "Clarke Bequest.")

23. "Edfou, Upper Egypt," by John F. Lewis, R.A.
(*See* Appendix, No. 1.)

II.—Bequests and Donations to the Gallery.

Bequeathed by Lady Eastlake.

1. "Ippolita Torelli," by Sir Charles Lock Eastlake, P.R.A.

Bequeathed by Miss Ellen Sansom.

2. "Portrait of Mr. Philip Sansom," by Sir T. Lawrence, P.R.A.
3. "Portrait of Philip Sansom as a Child," by Richard Westall.

Bequeathed by Mr. Samuel Sandars.

4. "Tobias and the Angel," by Adam Elsheimer.

Presented by Mr. Henry J. Pfungst, F.S.A.

5. "An Old Woman Sewing," Dutch School, XVI. Century.

Presented by the Earl of Carlisle.

6. "Portrait of James Northcote, R.A.," by John Jackson, R.A.

Presented by Mr. Edward Opie.

7. "Portrait of a Boy," by John Opie, R.A.

Presented by Mr. H. Yates Thompson.

8. A porphyry Bust of "The dying Alexander."

Presented by Mrs. Hueffer.

9. A palette used by the late Ford Madox Brown.

Presented by the Earl of Northbrook.

10. "An illuminated initial letter," Italian School.

Presented by Mr. Francis T. Palgrave.

11. "The Holy Family," by Eustache Le Sueur.

Presented by Mr. A. Fowell Buxton.

12. "Portrait of a Lady," by Jan Anthonisz Ravesteijn.

Presented by Mr. Lesser Lesser.

13. "A Portrait Group," by Le Nain.

Presented by an Anonymous Donor.

14. "St. John leading the Virgin Mary from the Tomb," by William Dyce, R.A.

Presented by Mr. George Salting.

15. "An architectural subject with Figures," by Domenico Beccafumi.

III.—Loans to Provincial Institutions.

Of the four Loan Collections of Turner's drawings and sketches:—

Nos. 1 and 2 having been returned from the Corporation Art Galleries at Rotherham and Wednesbury, remain with No. 3 at present deposited in the National Gallery. No. 4 still remains on loan at the Ruskin Art Museum at Meersbrook Park, Sheffield.

The

The National Gallery Board assented to the exchange of the picture entitled "The Worship of Bacchus," by George Cruikshank, lent by this Department to the Bradford Art Gallery, in 1884, for the following pictures lent by the National Gallery in the same year to the Albert Institute, at Dundee:—

1. "Raid on a Jew's House in the reign of Richard I.," by C. Landseer, R.A.

2. "Vintage on the Banks of the Gironde," by T. Uwins, R.A.

The cost of packing, carriage, insurance, &c., incidental to the exchange, has been defrayed by the authorities of the Bradford and Dundee Museums respectively.

IV.—Details relating to the Gallery and Establishment.

The New Gallery of Modern British Art.

Mr. Henry Tate, whose wish to present his collection of modern British pictures to the Nation has been long before the Public, and whose gift of a building in which to house them and to form a National Gallery of British Art had been accepted by the Government, having expressed to the Chancellor of the Exchequer a desire that the Collection should be under the control of the Trustees and Director of the National Gallery, the matter was brought before the Board at a special meeting on the 16th of June. The Board passed a resolution that it is prepared to accept the trust and control of the Tate gift, subject to the future consideration and approval of such details respecting the management and administration of the new gallery as may be settled between the Chancellor of the Exchequer and Mr. Tate; and the Trustees and Director, in accordance with a request from Mr. Tate, visited his collection at Streatham, and made the selection of such pictures as they considered suitable for the National Collection, and Mr. Tate consented to the exclusion of a certain small number. A deed of gift was drawn up by the Solicitor to Her Majesty's Treasury, and was agreed to by the Board; at a subsequent meeting the deed was executed, and, by request of Her Majesty's Office of Works, has been returned to that Department.

The necessity for enlarging the Gallery.

The Trustees and Director again call the attention of their Lordships to the want of space for the proper arrangement of the National Collection; in many of the rooms, the early Flemish room especially, it is necessary to hang valuable pictures in places where they cannot be properly seen, still less studied; there are many branches of art in which the collection is ill-represented, notably the French School of the 17th and 18th centuries, and it will shortly be impossible to find room for the necessary additions to fill up these and other gaps in the collection. Besides this, a gallery for the proper exhibition of the Turner water-colour collection, now housed in rooms on the ground floor, ill-adapted for the purpose, is urgently needed. It is respectfully suggested that while waiting for the promised removal of the adjoining barracks, a small further extension of the gallery to the west might be proceeded with at once. The Trustees and Director would call their Lordships' attention to the urgent necessity for the removal of the barracks. When it is considered that the barracks are in actual contact with the National Gallery buildings and that a fire might occur there at any moment (as actually happened some years ago at the Wellington Barracks) they trust that the priceless treasures of the National Collection may not be exposed to such a risk longer than is necessary.

Re-arrangement of Pictures in the Gallery.

A re-arrangement of some of the rooms in the Gallery was made during the autumn. The large picture by Holbein, called "The Ambassadors," had been standing on a screen in the Umbrian room since its purchase in 1891, where it was out of its proper surroundings and not well seen. In order to make room for it on the wall, Room No. IV. was cleared of the early Florentine pictures, some of the most important and earliest of which were placed in the North Vestibule at the head of the stairs, a remarkably well-lighted position, and others were inserted by re-adjustment in Rooms, I., II., and III. The Flemish pictures were removed from Room XI. to Room IV., and so arranged as to form room for placing the Holbein; not, however, without somewhat overcrowding the room, with the result that some of the pictures in this fine collection have to be placed where they are less well seen than heretofore. Room No. XI., thus set free, was devoted to pictures of the Dutch School, many of which had been scattered in the central octagon among Italian pictures, and many on screens, where they were very ill seen. The result is the better chronological arrangement of the Florentine pictures (though for want of space this

still remains somewhat imperfect), a better position for the Holbein, and an additional room, which was much wanted, for pictures of the Dutch School, and eleven screens, the use of which is always objectionable, as filling up the floor-space, were dispensed with. The principle of this re-arrangement was agreed on before the Director left for Italy in October last, and during his absence was carried out by the Keeper, Mr. Charles L. Eastlake.

The Velazquez and the Moroni, purchased at the same time as the Holbein, had previously been hung on the wall in the Spanish and Venetian rooms respectively.

Pictures Surface-Cleaned or Repaired and Varnished.

981. "A Storm at Sea," by W. Van de Velde: (surface cleaned and varnished).

1393. "View of a Mediterranean Sea Port," by Claude J. Vernet: (surface cleaned and varnished).

285. "Virgin and Child," by Francesco Morone: (panel repaired and varnished).

1395. "Portrait of Mrs. Bellenden Ker," by Sir Charles L. Eastlake: (surface cleaned and varnished).

1394. "Christ Washing Peter's Feet," by Ford Madox Brown: (re-lined and surface cleaned).

1404. "Portrait of J. Northcote, R.A.," by J. Jackson: (re-lined, cleaned and varnished).

1406. "The Annunciation," by Fra Giovanni Angelico: (repaired and varnished).

1406. "Portrait of a Boy," by John Opie, R.A.: (re-lined, cleaned and varnished).

1413. "Portrait of Mr. P. Sansom," by Sir Thomas Lawrence: (re-lined, cleaned, repaired and varnished).

1414. "Portrait of P. Sansom, jun.," by R. Westall: (cleaned, repaired and varnished).

1148. "Christ at the Column," by Velazquez: (repaired and varnished).

853. "The Triumph of Silenus," by Rubens: (re-lined, repaired and varnished).

1106. "The Resurrection of Our Lord," by Francesco Mantegna: (blister repaired).

80. "The Market Cart," by T. Gainsborough: (re-lined and varnished).

1316. "Portrait of an Italian Nobleman," by Moroni: (cleaned, repaired and varnished).

35. "Bacchus and Ariadne," by Titian: (re-lined, surface cleaned and varnished).

887. "Dr. Samuel Johnson," by Sir J. Reynolds: (re-lined and varnished).

307. "The Age of Innocence," by Sir J. Reynolds: (repaired and varnished).

1409. "The Mystic Marriage of St. Catherine," by Andrea Cordelle Agii: (cleaned, repaired and varnished).

1412. "Virgin and Child, with the Infant St. John," by Filippino Lippi: (repaired and varnished).

1417. "The Agony in the Garden," by Andrea Mantegna: (varnished).

962. "Cattle and Figures," by Albert Cuyp: (cleaned and varnished).

Pictures protected with Glass.

During the year 25 pictures have been covered with glass.

(*See* Appendix, No. 3.)

Number of Visitors to the Gallery.

The Gallery was visited by 498,182 persons on the public days during the year, showing a daily average attendance on such days (208 in number) of 2,395.

(*See* Appendix, No. 4.)

On Students' days (Thursdays and Fridays) 44,643 persons were admitted between the 1st of January and the 1st of December 1894; the admission fees (at 6*d.* each) amounting to 1,116*l.* 1*s.* 6*d.*, as compared with 974*l.* 8*s.* received in 1893.

The

The amount annually realised by admission fees is devoted as an "Appropriation in Aid" of the Parliamentary Vote to the National Gallery.

Copying Pictures in the Gallery.

The total number of students' attendances at the National Gallery on Thursdays and Fridays throughout the year was 20,232. Independently of partial studies, 865 oil-colour copies of pictures have been made, viz., 307 from the works of 83 old masters, and 558 from the works of 56 modern painters.

(*See* Appendix, No. 5.)

Catalogues of Pictures.

A new edition (the 77th) of the historical and descriptive Catalogue of pictures belonging to the Foreign Schools has been issued, and is at present on sale, price 1*s.* per copy.

The Catalogue of pictures belonging to the British and Modern Schools (on sale at 6*d.* per copy) is the 67th edition.

An abridged edition of the Foreign Schools Catalogue is on sale at 6*d.* per copy.

The proceeds of the sales are paid into Her Majesty's Exchequer as "Extra Receipts."

The total number of Catalogues sold in 1894 was 13,128.

(*See* Appendix, No. 6.)

Details relating to the Establishment.

Decease of two Trustees.

The Trustees and Director record with deep regret the decease of two Trustees of the National Gallery, viz.:—The Right Hon. Sir Austen Henry Layard, G.C.B. (appointed on the 13th of February 1866) and Lord Viscount Hardinge (appointed on the 11th of February 1874). The vacant Trusts have been filled up by the appointment of the Marquess of Lansdowne, K.G., and Sir Charles Tennant, Bart.

(*See* Treasury Letter, 13th September 1894.)

Office of Director.

On the retirement on the 21st of March last of Sir Frederic W. Burton from the office of Director, which he had filled during the past twenty years with so much distinction and with such advantage to the Collection under his care, the Lords Commissioners of H. M. Treasury were pleased to award him a pension of 500*l.* per annum.

(*See* Treasury Letter, 18th April 1894).

On the 8th of May 1894, Her Majesty's Treasury were pleased to appoint me Director of the National Gallery, for a period of five years, under the terms of a Treasury Minute, dated 26th April 1894, re-constituting the office, to succeed Sir F. Burton, retired.

(*See* Treasury Letter, 8th May 1894.)

Attendants' Staff.

Mr. Archibald Archer, one of the Curators in the Gallery, retired in January last, after 43 years' service, on a pension of 78*l.* 2*s.* 8*d.* per annum.

(*See* Treasury Letter, 27th January 1894.)

F. E. Nettle, Senior Assistant Porter, has been promoted to the vacant Curatorship at a salary of 105*l* 4*s.* per annum.

William Hyslop has been appointed to the Assistant Portership, vacated by the promotion of Nettle, at a salary of 66*l.* per annum.

(*See* Treasury Letter, 12th March 1894.)

In the month of June last, Mr. Charles Fuller, Head Porter in the National Gallery, resigned in consequence of illhealth, and was granted a pension of 21*l.* 9*s.* 8*d.*

(*See* Treasury Letter, 15th August 1894.)

Henry E. Austin, late of the 60th Rifles, has been appointed to the vacant Head Portership at a salary of 105*l.* 4*s.* per annum.

(*See* Treasury Letter, 21st July 1894.)

Mrs. Wenn and Mrs. Relph have been appointed Assistant Housemaids, in the place of Jane Wicks, dismissed, and Rosina Scrase, resigned.

(*See* Treasury Letter, 30th April 1894.)

Police Staff.

The police staff on permanent duty in the Gallery remains at the same strength as in 1893, viz., two inspectors, one serjeant, and 20 constables.

Finance.

The financial accounts relating to this establishment are, by direction of your Lordships, transmitted by the Accounting Officer (the Keeper and Secretary), monthly and annually, to the Exchequer and Audit Department, Somerset House.

I have, &c.

The Lords Commissioners of Her Majesty's Treasury.

(signed) *EDWARD J. POYNTER,* Director.

APPENDICES.

Appendix, No. 1.

Details respecting Pictures purchased during the Year.

(A.—*Purchased out of a Parliamentary Grant in Aid and a Special Vote.*)

1. *Gerard Terborch.* (1617?—1681.) Dutch School.—"Portrait of a Gentleman." Small full length; standing; three-quarter face. Dressed in a black velvet doublet, black hose, and a black cloak, with a plaited cambric shirt, a collar bordered with fine lace, and large muslin cuffs. His long dark brown hair falls in clusters to the shoulders. On his head he wears a black broad-brimmed sugar-loaf hat of felt trimmed with black ribbons.

On the right of the picture is a table overlaid with a large red velvet cloth. On the left is a chair covered with the same material. Both are trimmed with gold fringe. Warm grey background.

On panel, 2 feet 2 inches high by 1 foot 9 inches wide.

Purchased from the Collection of the late Sir Charles L. Eastlake, P.R.A., for 75*l.*

Hung (under glass) in the Gallery, No. 1399.

2. *Rembrandt van Ryn.* (1606—1669.) Dutch School.—"Christ before Pilate." On the left of the picture, Pilate occupying the judgment seat, raises his hand with a deprecatory gesture towards a group of Jews who seem to invoke his condemnation of Christ. At a little distance the Saviour is seen manacled and surrounded by guards and soldiers.

On the right of the composition is a circular court, with an arched entrance, through which a throng of people crowd upon the scene. Above this entrance is a clock, beneath which are inscribed the words—

"REMBRANDT FT." and a date "(16..?)."

In the centre of the court rises a square pier enriched with carving in low relief, and surmounted by the bust of a Roman Emperor.

This sketch is the original study for the etching of the same subject done in 1636. The etching is reversed.

Painted in *grisaille* on canvas, 1 foot 9⅜ inches high by 1 foot 5¾ inches wide.

From the Collections of W. Six, Goll and Brondgeest.

Purchased from the Collection of the late Sir Charles L. Eastlake, P.R.A., for 25*l.*

Hung (under glass) in the Gallery, No. 1400.

3. *Pieter Snyers.* (1681—1752.) Dutch School.—"A study of still-life." Fruit, flowers and vegetables, shell fish, and poultry, piled together on a table covered with a blue and white checked cloth. The group includes a large cray fish, feathered game, a basket containing apples, plums, peaches, &c., a china bowl full of strawberries, bundles of asparagus and radishes, artichokes and peonies — all represented of natural size and distributed in picturesque confusion.

Signed in large red letters as if embroidered on the corner of the table cloth. P. SNYERS.

On canvas, 3 feet 8¾ inches high by 3 feet 2¼ inches wide.

Purchased in London from Mr. Stephen Richards for 175*l.*

Hung (under glass) in the Gallery, No. 1401.

4. *Henry R. Morland.* (1730?—1797.) British School.—"The Laundry Maid." A half length figure rather less than life size. She wears a small cap and white dress printed with coloured sprigs, a low cut bodice and short sleeves. Around her throat is a narrow necklet of black velvet. She stands before a basin, washing linen. Grey background.

On canvas, 2 feet 5¼ inches high by 2 feet ¼ inch wide.

Hung (under glass) in the Gallery, No. 1402.

5. *Henry R. Morland.* (1730?—1797.) British School.—"The Laundry Maid." Rather less than life size and seen to the waist. Clad in a white gown delicately figured with pink sprigs, a low cut bodice and short sleeves. Her hair is drawn back from the forehead under a small muslin cap encircled by a blue ribbon. She sits at a table ironing.

On canvas, 2 feet 5¼ inches high by 2 feet ¼ inch wide.

Both this and the companion picture (No. 1402) are said to be portraits of ladies. They were purchased together from Messrs. P. and D. Colnaghi of Pall Mall East for 315*l.*

Hung (under glass) in the Gallery, No. 1403.

6. *Fra Giovanni Angelico.* (1387—1455.) Tuscan School.—"The Annunciation." In an arcaded porch or corridor, open to the air, and disclosing a flower garden in the middle distance, the Virgin, seated on the right hand of the composition, before a curtain of gold tissue, with a closed volume on her lap, bends forward with a reverential gesture towards the Angel Gabriel, who entering the porch from the opposite side, clad in a rose-coloured robe diapered with gold, approaches her in an attitude of deep respect. Above the Angel's head hovers the Holy Spirit in the form of a white dove.

The figures are about half life size.

On panel, 3 feet 4¾ inches high by 4 feet 7 inches wide.

Purchased in London from Messrs. Lawrie and Co. for 1,500*l.*

Hung (under glass) in the Gallery, No. 1406.

7. *William Dyce,* R.A. (1806—1864.) British School.—"Pegwell Bay, 1858." A view of the seashore at low tide, with evening light reflected from the sun, which is setting behind clouds. In the foreground are seen three ladies (one of them the artist's wife) gathering sea-shells, and a child with a toy-spade. The middle distance is intersected by low ridges of rock stretching out sea-ward. Beyond them rise the chalk cliffs of the bay crowned with verdure. In the centre of the sky may be discerned the great comet of the year in which the picture was painted.

Exhibited at the Royal Academy in 1860.

On canvas, 2 feet ½ inch high by 2 feet 10½ inches wide.

Purchased in London at the sale of Mr. J. Brand's Collection for 535*l.* 10*s.*

Hung (under glass) in the Gallery, No. 1407.

8. *Andrea Cordelle Agii.* (14..?—15..?.) Venetian School.—"The Mystic Marriage of St. Catherine." In the centre of the picture, the Virgin, seated bears the Infant Christ, undraped, on her lap, and assists Him to place a ring on the finger of St. Catherine, who, standing on the right, reverently extends her hand to receive it. St. John the Baptist stands on the left. Figures half length and about three quarter's life size. The landscape background includes a view of a road winding through hilly country. On the lower edge of the picture is a *cartellino* inscribed as follows:—

+ 1504 ANDREAS CORDELLI AGY DISSIPVLVS IOVĀNIS BELLINI PINXIT 24 I. (?)

On panel, 2 feet ½ inch high by 2 feet 9¼ inches wide.

Purchased in London at the sale of the late Lady Eastlake's Collection for 252*l.*

Hung (under glass) in the Gallery, No. 1409.

9. *Ambrogio Borgognone.* (1455?—1523.) Milanese School.—"The Virgin and Child." The Virgin, whose figure is seen at half length, stands behind a parapet, supporting on it the Infant Christ draped in a short yellow tunic. They hold between them a rosary of red beads. On the coping of the parapet lies an open service-book. The nimbus which surrounds the Madonna's head is inscribed in gold with the words:—

AVE. MARIA. GRATIA. PLENA. DOM.

In the background is a narrow chocolate-coloured curtain, on the right side of which is seen the façade of a building in a ruinous state, behind which is a large church. This may represent the old façade of the Certosa of Pavia before it was completed.

completed. On the left are other buildings which appear to be part of a convent. In the front of these Carthusian Friars in white robes are seen walking.

On panel, 1 foot 9⅝ inches high by 1 foot ⅞ inch wide.

Purchased in London at the sale of the late Lady Eastlake's Collection for 441*l.*

Hung (under glass) in the Gallery, No. 1410.

10. *Ercole de' Roberti.* (1450?—1496.) Ferrarese School.—"The Adoration of the Shepherds." "The Dead Christ." A Pietà (a diptych.) In the left hand panel, the Infant Christ is seen lying in a manger, by the side of which the Virgin and one of the shepherds kneel in adoration, while another shepherd approaches in a reverential attitude with clasped hands. In the rear is a stable constructed of hurdles. Inside it are seen an ox and an ass. In the distance is seen an angel appearing to shepherds. In the right hand panel is represented the Holy Sepulchre, on the edge of which two *angioletti* support the body of Our Lord in a sitting posture. Near a cave on the left St. Jerome kneels attended by his lion, and above in the distance is a calvary with the descent from the Cross. In the middle distance St. Francis, kneeling, receives the Stigmata.

On panel, each picture, 6¾ inches high by 5¼ inches wide.

Purchased in London at the sale of the late Lady Eastlake's Collection for 493*l.* 10*s.*

Hung (under glass) in the Gallery, No. 1411.

11. *Filippino Lippi.* (1457?—1504.) Tuscan School.—"The Virgin and Child with the Infant St. John." The Virgin, whose figure is seen at three-quarter length, clad in robes of the traditional colours, with a white head veil, stands behind a marble parapet or balcony bearing in her arms the Infant Christ, who is playing with a pomegranate. By her side is the youthful St. John in an attitude of adoration. On the balcony near him lies an open missal or service book. Further to the right, also on the balcony, is a shallow vase filled with flowers. Landscape background, with a distant view of buildings.

On panel, 1 foot 11¼ inches high by 1 foot 5 inches wide.

Purchased in London at the sale of the late Lady Eastlake's Collection, where it was ascribed to Botticelli, for 756*l.*

Hung (under glass) in the Gallery, No. 1412.

12. *Gerard Dou.* (1613—1675.) Dutch School.—"Supposed portrait of Anna Maria van Schurman." Miniature; seen to the waist; three-quarter face. Clad in brown velvet gown trimmed with white swansdown, over a chemisette of plaited linen. On her head she wears a large muslin cap, the sides of which conceal the ears and most of the hair.

An old inscription on the back of the panel states that this picture is a portrait of Anna Maria van Schurman; but it will be observed that the portrait by Jan Lievens (No. 1095 in the National Gallery) supposed to represent the same lady differs in the colour of her hair, and has other points of variation which preclude the possibility of both having been painted from the same person.

On panel, 6 inches high by 5 inches wide.

Purchased from Mr. Horace Buttery, of 173, Piccadilly, W., for 120*l.*

Hung (under glass) in the Gallery, No. 1415.

13. *Andrea Mantegna.* (1431—1506.) Paduan School.—"The Agony in the Garden." In a rocky landscape the Saviour kneels in prayer on a rising ground, and sees in a vision five angels bearing the instruments of Passion. Below, in the foreground, the three disciples are sleeping heavily by the side of the brook Kedron, which flows in front; and on a withered tree sits a cormorant; rabbits are playing round, and two egrets stand in the water. In the background is the city of Jerusalem, and a procession of soldiers, led by Judas, is descending the road from one of the gates.

The original suggestion for this treatment of the subject appears in a composition in Jacopo Bellini's sketch-book in the British Museum. A precisely similar treatment, but differently arranged, is to be found in the picture by Giov. Bellini (No. 726) in the National Gallery; and again in the picture by Mantegna in the

Museum at Tours, which formed one of the three predella pictures to the great altar-piece in S. Zeno at Verona.

Signed:—OPVS. ANDREAE. MANTEGNA on the rock over the sleeping disciples.

Painted in 1459 for Giacomo Marcello, Podesta of Padua.

On panel, 2 feet $\frac{5}{8}$ inch high by 2 feet $7\frac{1}{2}$ inches wide.

Formerly in Cardinal Fesch's Collection, and then in that of Mr. William Coningham; it then belonged to Mr. Thomas Baring, whose pictures afterwards passed to the Earl of Northbrook, from whom the present picture was purchased for 1,500*l.*

Hung (under glass) in the Gallery, No. 1417.

14. *Antonello da Messina.* (1444 ?—1493 ?.) Venetian School.—"St. Jerome in his Study." The subject is enclosed by a large stone segmental-headed archway, which admits light into an apartment roofed with a Gothic vault and paved with tiles. A portion of this room is occupied by a wooden structure raised on a platform ascended by steps. On this platform St. Jerome sits at a desk, turning over the leaves of an open volume. Behind and in front of him rise shelves filled with books, pottery, and other articles. Towards the right of the picture St. Jerome's emblematical lion is seen in a vaulted corridor lighted by two windows, with landscape in distance. On the left, at the end of a passage, is another window with a distant view of meadows and buildings. On a step in the foreground are a peacock and another bird, probably intended to represent a partridge.

This picture is mentioned by the *anonimo* of Morelli as being in the possession of Antonio Pasqualino in Venice in 1529 where it was variously attributed to Antonello, to Jan van Eyck, and to Memlinc. He himself considered it to be by "Jacometto," meaning, probably, Jacopo de' Barbari. There seems little doubt that the attribution to Antonello da Messina is the right one.

On panel, 1 foot 6 inches high by 1 foot $2\frac{1}{8}$ inches wide.

Formerly in the Collection of Sir Thomas Baring, at whose sale it was bought by Mr. William Coningham in 1848. It came ultimately into the possession of the Earl of Northbrook, from whom it was purchased for the National Gallery for 2,500*l.*

Hung (under glass) in the Gallery, No. 1418.

15. *Flemish School.* (XVth century).—"The Legend of St. Giles." On the right hand of the picture the Saint, clad in hermit's robes, sits on a rocky bank surrounded by shrubs and wild flowers. He is tenderly protecting a hind, which has fled from a hunting party towards him, and his right hand is transfixed by an arrow which was intended for the animal. Kneeling before St. Giles, as though to implore forgiveness for the misadventure, is a young man richly clad in a green velvet mantle faced with scarlet and gold brocade. He is attended by a companion draped in a crimson mantle who stands by him, and who is supposed by Mr. Weale, in his catalogue of the Flemish portion of Lord Northbrook's Collection, to represent the painter of the picture. An ecclesiastic kneels on the other side. In the immediate foreground is a group of irises, and to the right a plant of mullein, finished with great delicacy of execution. In the middle distance are seen retainers and huntsmen —one mounted on a white horse—near the trunk of a large tree. Beyond is a rocky landscape with the distant view of a town and hilly country.

This picture formed part of a diptych, of which the companion picture, representing St. Giles elevating the Host before a group of worshippers, belonged formerly to the Earl of Dudley, from whose Collection it was bought at Christie's in 1892 by Mr. Edward Steinkopff.

On panel, 2 feet high by 1 foot 6 inches wide.

Exhibited at the Burlington Fine Arts Club in 1892, and at the Royal Academy Winter Exhibition of Works by Old Masters in 1893–94.

Formerly in the Collection of Mr. Th. Emerson and of Mr. Webb.

Purchased from the Earl of Northbrook for 2,000*l.*

Hung (under glass) in the Gallery, No. 1419.

16. *Gerrit A. Berck-Heyde.* (1638—1698.) Dutch School.—"A view in Haarlem." A view in bright sunlight of a public square or market place near a Gothic church, from the crux of which rises, in the middle distance, a richly detailed belfry. On the

the right of the scene are several lofty brick houses surmounted by stepped gables. On the right of the foreground is seen part of a Doric porch or colonnade supporting a balustraded balcony. The square is enlivened by numerous figures, chiefly men, who walk or stand in conversation. On the left a cavalier and lady stroll towards the spectator, followed by a dog.

On canvas, 1 foot 8⅛ inches high by 2 feet 2 inches wide.

Purchased in London, at the sale of Mr. Adrian Hope's Collection, for 472*l.* 10*s.*

Hung (under glass) in the Gallery, No. 1420.

17. *Jan Steen.* (1626?—1679.) Dutch School.—"A Terrace scene, with Figures." On the floor of a marble-paved terrace, partly enclosed by balustrading and overlooking a garden, a lady reclines with a book of music open on her lap. Close to her, and sitting on an inverted tub, with a small red feather in his hat, a man, who seems to be singing, turns towards her, holding a glass of wine in his hand.

Further to the right, and partly concealed by a stone plinth, is a musician playing on a mandolin. A tree overshadows the group. On the left is an open basket containing fruit, a linen napkin, &c.

On panel, 1 foot 5 inches high by 2 feet wide.

Purchased in London, at the sale of Mr. Adrian Hope's Collection, for 819*l.*

Hung (under glass) in the Gallery, No. 1421.

18. *Antonio Canale* (Il Canaletto). (1697—1768.) Venetian School.—"Interior of the Rotunda at Ranelagh in London," showing the orchestra and musicians, and numerous groups promenading.

On canvas, 1 foot 6½ inches high by 2 feet 5½ inches wide.

Purchased in London from Mr. Horace Buttery for 120*l.*

Hung (under glass) in the Gallery, No. 1429.

19. *Pietro Vannucci* (Il Perugino). (1446—1523.) Venetian School.—"The Baptism of our Lord." St. John the Baptist in the centre of the picture is pouring water from a cup on the head of the Saviour, who stands with His feet in the shallow river. Two Angels kneel to the right and two to the left; and behind them again stand four of the disciples, two on each side of the picture. The River Jordan occupies the centre of a landscape of rocks, hills, and dark trees against an evening sky, and winds away to the extreme distance.

On panel, 1 foot ¾ inch high by 1 foot 11¼ inches wide.

Purchased in Rome, for 400*l.*

Hung (under glass) in the Gallery, No. 1431.

(B.—*Purchased out of the Lewis Fund.*)

20. *Filippo Mazzola.* (14....?—1505.) Parmese School.—"The Virgin and Child with two Saints." In the centre of the picture the Virgin offers a pear or quince to the Infant Christ, who sits, undraped, on her lap caressing a bird which He holds in His hand. On the left, and close behind the child, stands St. Jerome with his hands closed in prayer. On the right hand is another Saint bearing a closed volume, on which is placed a small figure of the Saviour standing before a cross in a stone niche. The Virgin and Saints are seen at half length and painted about half the size of life. Background of sky.

Signed, PHILLIPUS MAZOLA, P.P. Enclosed in an old Italian frame of early cinque-cento pattern, richly carved, gilt and painted, probably its original frame.

On panel, 1 foot 9¾ inches high by 2 feet 5 inches wide.

Purchased in London from Mr. C. Fairfax Murray for 120*l.*

Hung (under glass) in the Gallery, No. 1416.

21. *Hans Baldung,* surnamed *Grün.* (1476?—1545.) German School.—"The dead Christ; a Pietà." The figure of Our Lord supported by the Virgin and St. John is seen at half length above the edge of a red marble tomb; behind the group stands

Joseph of Arimathea. The background is gold with some clouds, from which the Holy Spirit, in the form of a dove, is descending. Below in small are kneeling figures of the Donor and his family, with two coats of arms.

Signed and dated, HANS BALDUNG. 1512.

On panel, 3 feet 7½ inches high by 2 feet 10½ inches wide.

Purchased in London from Mr. George Donaldson for 600*l.*

Hung (under glass) in the Gallery, No. 1427.

22. *R. H. Lancaster.* (. . . ?—1850.) British School.—"A view of the Town Quay at Southampton, with the Old Jail, and the South or God's House Gate." On the right in the foreground is the quay with blocks of stone; beyond is seen a tower and other buildings, with the arch of a bridge in front. A jetty surrounded by boats runs out into the middle of the picture, and in the distance are the wooded banks of Southampton Water. The whole is illuminated by a warm afternoon sun.

On canvas, 2 feet 10½ inches high by 4 feet 5¾ inches wide.

Purchased in London from Messrs. P. and D. Colnaghi, for 84*l.*

Hung (under glass) in the Gallery, No. 1428.

(C.—*Purchased out of "Clarke Bequest."*)

23. *John Frederick Lewis,* R.A. (1805—1876.) British School.—"Edfou, Upper Egypt." On the right of the foreground two camels lie on the ground laden with pack-saddles, &c. Behind them is seen a tent of white canvas pitched between the walls of Edfou and its temple, whose propylon and colonnade form conspicuous objects in the middle distance. Beyond is a plain dotted with palm trees which rise between the village and the Nile, the opposite banks of which are bounded by hills. Above the latter, cloud cumuli hover over the horizon or rise into a summer sky. On the left of the foreground an Arab chief reclines on the ground. Several other figures are seen in the middle distance.

On panel, 11¾ inches high by 2 feet 6½ inches wide.

Purchased in London from Messrs. T. Agnew & Sons, for 850*l.*

Hung (under glass) in the Gallery, No. 1405.

Appendix, No. 2.

Bequests and Donations to the Gallery.

Bequeathed by Lady Eastlake.

1. *Sir Charles L. Eastlake,* P.R.A. (1793—1865.) British School.—"Ippolita Torelli." A life-size figure seated, and seen to the waist. Dressed in a plum-coloured velvet gown, with a low-cut bodice which leaves the chest bare, and large sleeves lined with pale rose-coloured silk. A thin white kerchief, folded like a turban, surrounds her head. She rests her elbow on the arm of her chair or couch, and supports her head with her right hand. In her left she holds a string of pearls. Background of green drapery.

Ippolita Torelli was the wife of Baldassare Castiglione, an Italian soldier, statesman and poet (1478–1529). Left in Mantua, two years after her marriage; she is supposed to have written, in Latin verse, to her husband, then at the Court of Pope Leo X., complaining that in his absence her jewels gave her no pleasure.

On canvas, 2 feet 11¼ inches high by 2 feet 4⅝ inches wide.

Placed (under glass) in the Gallery, No. 1398.

Bequeathed by Miss Ellen Sansom.

2. *Sir Thomas Lawrence,* P.R.A. (1769—1830.) British School.—"Portrait of Mr. Philip Sansom." Life size; seated; seen to the knees; three-quarter face. Dressed in a black coat, buttoned across the chest, and cream-coloured kerseymere breeches. He sits in an armchair, resting his right hand on a table. In the background a red curtain and an open window.

On canvas, 4 feet 5⅜ inches high by 3 feet 3½ inches wide.

Hung (under glass) in the Gallery, No. 1413.

3. *Richard Westall,* R.A. (1765—1836.) British School.—"Portrait of Philip Sansom, junior, when a child." Apparently about three years old. Life size; full length. Dressed in a short sleeved white frock, with a close-fitting muslin cap on his head. The child stands in a garden or shrubbery, near the trunk of a tree, gathering flowers.

On canvas, 4 feet 5 inches high by 3 feet 3 inches wide.

Hung (under glass) in the Gallery, No. 1414.

Bequeathed by Mr. Samuel Sandars.

4. *Adam Elsheimer.* (1578—1620?) German School.—"Tobias and the Angel." In a thickly-wooded landscape, disclosing a distant view of hilly country, Tobias, on the right hand of the picture, walks bare-foot and bare-headed, dragging the fish after him. (Tobit, Chap. VI.). He is closely followed by the Angel, who, dressed in a blue robe and maize-coloured mantle, bears a staff in his hand.

Etched by Count Gondt in 1613.

This picture has passed through many Collections, beginning with that of Count Gondt. It was afterwards Mr. Beckford's, of Fonthill.

On panel, 7⅛ inches high, by 10¾ inches wide.

Hung (under glass) in the Gallery, No. 1424.

Presented by Mr. Henry J. Pfungst.

5. *Unknown.* (16th Century.) Dutch School.—"An old woman sewing." Apparently of the peasant class. She wears a black gown, a blue apron, a large linen kerchief, which falls in two points on her chest, and a close-fitting linen cap which conceals her ears. She sits in a rustic chair stitching linen over a cushion which lies on her lap. On the left is a cloth-covered table, on which are a drinking vessel, a knife, a half-peeled lemon, and a pair of scissors. On the right of the foreground is a basket containing linen and a cloth. On the wall behind is the engraved portrait of a gentleman, bearing an inscription in which the name of Jan van Aach occurs, with the date 1655.

On canvas, 3 feet 6½ inches high by 2 feet 8¼ inches wide.

Hung (under glass) in the Gallery, No. 1397.

Presented by the Earl of Carlisle.

6. *John Jackson,* R.A. (1778—1831.) British School.—"Portrait of James Northcote, R.A." Life size; seen to the knees; three-quarter face. Dressed in a dark-blue morning gown with a fur collar. He sits in an armchair near a table holding an open volume. Dark background. Painted when the sitter was apparently about seventy years of age.

On canvas, 4 feet 4 inches high by 3 feet 2 inches wide.

Hung (under glass) in the Gallery, No. 1404.

Presented by Mr. Edward Opie.

7. *John Opie,* R.A. (1761—1807.) British School.—"Portrait of a boy." Apparently about ten or twelve years of age. Life size; bust length; three-quarter face turned to the right, with thick chestnut hair falling to the shoulders. He wears a dark coat or frock open at the neck, which is encircled by a large white frilled collar.

Believed to be a portrait of the artist's younger brother, William Opie.

On canvas, 1 foot 8⅜ inches high by 1 foot 4⅜ inches wide.

Hung (under glass) in the Gallery, No. 1408.

Presented by Mr. H. Yates Thompson.

8. A presumably antique bust of the "Dying Alexander," sculptured in porphyry, supported on a circular shaft or pedestal of the same material, the base mouldings being encased in hand-wrought brass of fine French workmanship.

Placed in the North Vestibule.

Presented by Mrs. F. Hueffer.

9. A palette used by the late Ford Madox Brown.

Placed (under glass) in the Gallery.

Presented by the Earl of Northbrook.

10. *Unknown.* Italian School. (16th century.)—"Illuminated initial letter." The letter D, painted in gold and colours on a blue ground. It is ornamented with floriated scroll-work, terminating in vines and grapes in gold, among which are seven *angioletti* bearing the instruments of the Passion. Enclosed within the letter is painted the *Agony in the Garden,* which is copied in its main features from the picture by *Andrea Mantegna,* No. 1417 in the National Gallery.

On vellum, 7¾ inches high by 7½ inches wide.

Hung (under glass) in the Gallery, No. 1417A.

Presented by Mr. Francis T. Palgrave.

11. *Eustache Le Sueur.* (1616—1655.) French School.—"The Holy Family." In the interior of a lofty stone building, supported on columns, the Virgin, clad in a pale red robe and blue mantle, stands on the left hand of the picture with her foot on a stool or block of masonry, bearing in her arms the infant Christ, who raises His hand, in the act of benediction, towards St. Elizabeth and St. John, who kneel on the right. Behind them St. Joseph, leaning on a staff or implement of carpentry, seems to watch the Holy Children.

On canvas, 2 feet 1¼ inches high by 1 feet 7½ inches wide.

Hung (under glass) in the Gallery, No. 1422.

Presented by Mr. A. Fowell Buxton.

12. *Jan A. Ravesteijn.* (1572—1657.) Dutch School.—"Portrait of a Lady." Middle aged; life size; bust length; three-quarter face. She wears a black dress, with a large white linen collar descending to the shoulders and bordered with a narrow frilling. Her head is covered with a close-fitting black cap, which conceals the ears and most of the hair.

On panel, 2 feet 2 inches high by 1 foot 7½ inches wide.

Hung (under glass) in the Gallery, No. 1423.

Presented by Mr. Lesser Lesser.

13. *Le Nain.* (15 . . . ?—1648). French School.—"A Portrait Group." A peasant woman sits surrounded by rustic children. On a chair in front of her a boy in a red coat, drab coloured breeches and blue stockings, holds a drinking glass in one hand and is about to raise a stone jug with the other. Four little girls, humbly but picturesquely clad, complete the group. Dark grey background.

Formerly in the Bohn Collection.

On panel, 10 inches high by 1 foot ¼ inch wide.

Hung (under glass) in the Gallery, No. 1425.

Presented by an anonymous Donor.

14. *William Dyce*, R.A. (1806—1864.) British School.—"St. John leading the Virgin Mary from the Tomb." The Evangelist, standing in the foreground, clad in a dark grey robe with drab-coloured drapery wrapped round the lower part of his body, leads the Virgin who walks by his side draped in a crimson robe and dark blue mantle. She rests her right hand in that of St. John, and holds in her left the crown of thorns removed from our Saviour's head. In the middle distance, on the left of the picture is a garden enclosing the Holy Sepulchre at the entrance to which two of the Holy Women kneel mourning, while two male figures (Nicodemus and Joseph of Arimathea?) are seen leaving the garden.

On canvas, 2 feet 5½ inches high by 3 feet 6 inches wide.

Hung (under glass) in the Gallery, No. 1426.

Presented by Mr. George Salting.

15. *Domenico Beccafumi.* (1486—1551.) Sienese School.—"An architectural subject, with Figures." This is probably a fantastic treatment of the visit of the Queen of Sheba to Solomon. Under a dark arched building a female figure with others grouped round her is approaching a seated figure on a throne, and is introduced by a youth standing on the steps. Other figures apparently intended for Orientals follow in her train, and various groups in the foregound point with an appearance of interest to the scene taking place under the archway. On the right a lady is emerging from a litter. The background is filled up with isolated buildings and ruins, behind which is seen a river crossed by a bridge with mountains in the distance.

On panel, 2 feet 5 inches high by 4 feet 6 inches wide.

Hung (under glass) in the Gallery, No. 1430.

Appendix, No. 3.

List of Pictures which have been Protected with Glass during the Year.

Number in Catalogue.	Painter.	Subject of Picture.
1397	Dutch School - - -	An old Woman Sewing.
1400	Rembrandt van Rÿn - -	Christ before Pilate.
1401	Snyers, P. - - - -	Fruit-piece.
1402	Morland, H. R. - - -	The Laundry Maid.
1403	- ditto - - - -	- ditto - ditto.
1404	Jackson - - - -	Portrait of James Northcote, R.A.
1406	Angelico, Fra G. - - -	The Annunciation.
1408	Opie - - - - -	Portrait of a Boy.
1409	Cordelle Agii, Andrea - -	The Marriage of St. Catherine.
1410	Borgognone - - - -	The Virgin and Child.
853P	Rubens - - - -	Sketch of a Lion Hunt.
1413	Lawrence, Sir T. - - -	Portrait of Mr. P. Sansom.
1414	Westall - - - -	Portrait of P. Sansom as a Child.
1416	Mazzola - - - -	The Virgin and Child with two Saints.
1412	Lippi, F. - - - -	The Virgin and Child.
1418	Antonello da Messina - -	St. Jerome in his Study.
1419	Flemish School - - -	The Legend of St. Giles.
1420	Berck-Heyde, G. A. - -	A view in Haarlem.
1421	Steen, Jan - - - -	A Terrace Scene, with Figures.
1415	Dou, Gerard - - -	Supposed Portrait of Anna Maria van Schurman.
1411	Roberti, Ercole de' - -	The Adoration of the Shepherds, &c.
1417	Mantegna, Andrea - -	The Agony in the Garden.
1423	Ravesteijn, Jan A. - -	Portrait of a Lady.
1425	Le Nain - - - -	A portrait Group.
1424	Elsheimer, Adam - - -	Tobias and the Angel.

Appendix, No. 4.

Number of Visitors to the National Gallery on Public Days during the Year.

Month.	Number of Days.	Numbers.	Month.	Number of Days.	Numbers.
January - -	19	34,690	August - -	17	68,264
February - -	16	32,075	September -	17	52,640
March - -	17	31,677	October - -	19	41,443
April - -	17	38,647	November - -	16	27,015
May - - -	18	53,338	December - -	16	28,292
June - - -	17	41,461			
July - - -	18	48,640	Total - -	208	498,182

Daily Average - - - - 2,395.

Appendix, No. 5.

Details relating to Copying in the Gallery.

Number of attendances on Students' days during the year - 20,232

New Students entered in the books - - - - - 272

Daily average attendance of Students:

In oil colours - - - - - - -	160	195
In water colours - - - - - - -	35	

Return of Pictures Copied in Oil during the Year.

Foreign Schools.			*British and Modern Schools.*		
Number of Copies.	Number of Pictures Copied.	Number of Masters.	Number of Copies.	Number of Pictures Copied.	Number of Masters.
307	145	83	558	159	56

Appendix, No. 6.

Return of Number of Catalogues Sold during the Year.

		£. s. d.
Foreign Schools (Wide Margin Edition):		
Catalogues at 3*s.* each - - - - - - -	90	13 10 –
Foreign Schools:		
Catalogues, at 1*s.* each - - - - - - -	1,593	79 13 –
Foreign Schools (Abridged Edition):		
Catalogues, at 6*d.* each - - - - - - -	3,705	92 12 6
British and Modern Schools:		
Catalogues, at 6*d.* each - - - - - -	7,740	193 10 –
Total - - -	13,128	379 5 6

RULES FOR ADMISSION OF STUDENTS.

STUDENTS are admitted to copy in the NATIONAL GALLERY on Thursdays and Fridays between 10 a.m. and 5 p.m. (or 4 p.m. in winter), subject to the following Rules:—

1. Each applicant for admission is required to write a letter to the Keeper, giving the name and address of a referee resident in London, and sending a specimen of the applicant's work in oil or water-colour, signed or otherwise authenticated.

2. In cases where the applicant has recently exhibited at the Royal Academy, or any other well-known exhibition of pictorial art in London, a letter giving the title of the picture and the date of the exhibition, with the name and address of a referee resident in London, will suffice.

3. In cases where the applicant is a student of the Royal Academy, or of any Government School of Art in London, a letter of recommendation from the Keeper of the Royal Academy, or from the head master of such Government School, will suffice, and should be enclosed in the letter of application.

4. A card of admission once issued will be always available, unless it is for any special reason withdrawn by authority. Should the card be lost or mislaid, the student will be required to make a fresh application for admission in conformity with the foregoing rules.

5. Students attending at the Gallery on Thursdays and Fridays are required to show their admission cards, sign their names and enter their numbers in a book kept for that purpose in the entrance hall.

6. Not more than one copying place in the Gallery can be reserved for one student at the same time, and, in order to prevent inconvenient crowding, not more than two students are permitted to copy from the same picture. No exception can be made to this rule.

7. Students desiring to copy from a picture, the places before which are already occupied, should leave their names with the Curator in charge, who will assign them places in order of the date of their application. Those who only attend on one day of the week cannot have places reserved for them to the exclusion of other students who attend on both days.

8. Any student engaged in copying a picture, and being absent for an entire day without having given notice in writing to the Keeper before the end of the day, will forfeit his or her place, if another application be made for it meanwhile, and must in that case await the next vacancy. In such notice the title of the picture and number of the room should be distinctly stated.

9. Students wishing to have the glass removed from glazed pictures, when finishing their copies, should apply (a week previously) to the Curator in charge, who will communicate such request to the Keeper, without whose sanction no glass is to be taken off. Copies must be removed from the Gallery by their owners within a fortnight after completion.

10. Any lady student desiring to be accompanied by a relation or friend during her studies must give notice to that effect in a letter to the Keeper, stating the number of her student's card; and such relation or friend will only be entitled to free admission when provided with a ticket, and in company with the lady student who has thus applied.

11. Students will be required to keep their chairs, easels, canvases, sketch books, and brushes outside the rail fixed for the protection of pictures, or where there is no rail, at such a reasonable distance as may preclude the chance of accidents. In no case is the surface of the picture to be touched.

12. A scrupulous attention to order and cleanliness will be expected from students. Palettes and brushes are not to be washed in the lavatories; separate accommodation being provided for that purpose. Chairs and sketching stools are provided in the Gallery, but students are required to bring their own easels. Information on this and similar matters may be obtained on application to the Curators.

By authority,

Charles L. Eastlake,

Keeper and Secretary.

SUPPLEMENT TO REPORT.

(A.)

RETURN of the Sums expended by the Trustees and Director of the NATIONAL GALLERY from 1884-85 to 1894, in the Purchase of Pictures, from Monies provided by Parliament (in continuation of the Return to the Order of the House of Lords, dated 13th July 1869.)

No. in the Gallery.	Subject of Picture.	Painter.	Date of Purchase.	Former Proprietor.	Price. £.	s.	d.	REMARKS.
1171	The Virgin and Child attended by St. John the Baptist and St. Nicholas of Bari.	Sanzio Raffaelle -	1884–85	The Duke of Marlborough.	70,000	–	–	Purchased by Her Majesty's Government.
1172	An Equestrian Portrait of King Charles I.	Dyck, Sir A. van -	—	- - ditto - -	17,500	–	–	
1239	The Massacre of the Innocents (Scene I.) - - - - -	Mocetto, G. - -	1887–88	Dr. Jean P. Richter	600	–	–	
1240	The Massacre of the Innocents (Scene II.) - - - - -							
1241	Mary Magdalene led by Martha to hear the preaching of Christ.	Campaña, P. - -	—					
1242	Stirling Castle - - - - -	Nasmyth, A. - -	—	Mr. Martin Colnaghi	126	–	–	
1243	Portrait of a Young Man - - -	Dutch School -	—	Mr. M. Roberts -	50	–	–	
1247	The Card Players - - - - -	Maes Nicholas -	1888–89	From the Gatton Park Collection.	1,375	10	–	£.1,224 was paid from Government Funds, and the balance of 151*l.* 10*s.* from the interest of the Lewis Fund.
1259	Portrait of the Countess of Albemarle.	Reynolds, Sir J. -	1889–90	Messrs. T. Agnew and Sons.	3,150	–	–	
1291	The Assumption of the Virgin -	Valdes Leal - -	—	Lady Louisa Charteris.	400	–	–	
1296	A Rural Landscape - - - -	Zais, G. - - -	—	Signor C. Ricchetti	200	–	–	
1297	A River-side Scene - - - -							
1298	Landscape, River Scene - -	Unknown - -	—	Signor S. Bardini -	2,000	–	–	
1299	Portrait of a Youth - - - -	Ghirlandajo, D. del.						
1295	Madonna and Child, with Saints -	Giovenone, Gir -	—	Signor A. Carrer -	320	–	–	
1314	"The Ambassadors" - - - -	Holbein Hans, the younger.	—	The Earl of Radnor	55,000	–	–	Purchased by Her Majesty's Government, who contributed 25,000*l.*, and Messrs. N. M. Rothchild and Sons, Lord Iveagh, and Mr. C. Cotes, 10,000*l.* a-piece.
1315	Portrait of Admiral Pulido Pareja	Velazquez - -						
1316	Portrait of an Italian Nobleman -	Moroni, G. B. -						
1305	Portraits of Jan van Hensbeeck and his Wife.	Donck, G. - -	—	Mr. S. Richards -	166	–	–	
1309	Portrait of a Young Man - - -	Licinio, B., called Pordenone.	—	From the Perkins Collection.	288	15	–	Sale by auction.
1310	"Ecce Homo" - - - - -	Bellini, Giov. (ascribed to).	—	- - ditto - -	535	10	–	- ditto.
1311	A Winter Scene - - - - -	Beerstraaten - -	—	Messrs. P. & D. Colnaghi.	75	–	–	
1312	The Village Cobbler - - -	Victors, J. de -	—	- - ditto - -	73	–	–	
1313	The origin of the Milky Way -	Robusti, called Tintoretto.	—	The Earl of Darnley	2,500	–	–	
1318	"Unfaithfulness" - - - - -	Paolo Veronese -						
1319	Landscape and View in Rome -	Gellée, called Claude Lorraine.	—	Count St. Martin d'Aglié.	175	–	–	
1324	"Scorn" (an allegorical group) -	Paolo Veronese -	1891–92	The Earl of Darnley	2,500	–	–	
1326	"Happy Union" (an allegorical group).							
1336	The Death of Dido - - - -	Liberale da Verona						
1337	"Ecce Homo" - - - - -	Bazzi, called Sodoma						
1338	The Adoration of the Shepherds -	Fabritius, B. - -						
1339	The Nativity of St. John - -							
1340	Landscape - - - - - -	Roghman, R. - -						
1341	Landscape, with Figures - -	Decker, C. - -						
1342	Landscape - - - - - -	Wet, J. de - -	—	Mr. Edward Habich	2,807	–	–	
1343	Amsterdam Musketeers on Parade	Unknown - -						
1344	Landscape - - - - -	Ruisdael, S. van. -						
1345	Landscape - - - - -	Wouwerman, P. -						
1346	A Winter Scene - - - -	Avercamp, H. van -						
1347	A Farm-yard Scene - - - -	Ostade, I. van. -						
1348	Landscape, with a Goat and Kid	Velde, A. van de -						
1383	A Young Lady at a Spinet - -	Vermeer, Jan -	1892-93	Messrs. Lawrie & Co.	2,400	–	–	
1386	Soldiers Quarrelling over their Booty - - - - - -	Duyster, W. C. -	1893–94	Mr. Romer Williams	1,250	–	–	
1387	Players at Tric-trac - - -							

(A.)—RETURN of the Sums expended by the Trustees and Director of the National Gallery from 1884–85 to 1894, in the Purchase of Pictures, &c.—*continued.*

No. in the Gallery.	Subject of Picture.	Painter.	Date of Purchase.	Former Proprietor.	Price.	REMARKS.
					£. s. d.	
1390	View on the Shore at Scheveningen.	Ruisdael, J. van	1893-94	Form the Bingham Collection.	3,045 – –	Sale by auction.
1396	Portraits of Mr. and Mrs. W. Lindow.	Romney, G.	—	Mr. J. J. Wigzell	735 – –	
1399	Portrait of a Gentleman	Terborch, G.	1894–95	Lady Eastlake	75 – –	
1400	Christ before Pilate	Rembrandt	—	ditto	25 – –	
1401	A Study of Still Life	Snyers, P.	—	Mr. Stephen Richards	175 – –	
1402	The Laundry Maid	Morland, H. R.	—	Messrs. P. & D. Colnaghi.	315 – –	
1403	The Laundry Maid	Morland, H. R.	—	Messrs. P. & D. Colnaghi.	315 – –	
1406	The Annunciation	Angelico, Fra G.	—	Messrs. Lawrie & Co.	1,500 – –	
1407	Pegwell Bay, Kent	Dyce, William	—	Mr. James Brand	535 10 –	Sale by auction.

Edward J. Poynter, Esq., R.A., Director, appointed to succeed Sir Frederic W. Burton, LL.D., 8th May 1894.

1409	Marriage of St. Catherine	Cordelle Agii, Andrea	—	Lady Eastlake	252 – –	Sale by auction.
1410	The Virgin and Child	Borgognone, A.	—	ditto	441 – –	Sale by auction.
1411	Adoration of the Shepherds.—The Dead Christ.	Roberti, Ercole de'	—	ditto	493 10 –	Sale by auction.
1412	The Virgin and Child, with St. John.	Lippi, Filippino	—	ditto	756 – –	Sale by auction.
1415	Supposed Portrait of Anna Maria van Schurman.	Dou, Gerard	—	Mr. Horace Buttery	120 – –	
1417	The Agony in the Garden	Mantegna, Andrea	—	The Earl of Northbrook.	1,500 – –	
1418	St. Jerome in his Study	Antonello da Messina	—	ditto	2,500 – –	
1419	The Legend of St. Giles and the Hind.	Early Flemish School.	—	ditto	2,000 – –	
1420	A View in Haarlem	Berck-Heyde, G.	—	From the Adrian Hope Collection.	472 10 –	Sale by auction.
1421	A Terrace Scene, with Figures	Steen, Jan	—	ditto	819 – –	Sale by auction.
1429	The Rotunda at Ranelagh	Canale, Antonio	—	Mr. Horace Buttery	120 – –	
1431	The Baptism of Our Lord	Perugino, Pietro	—	Mr. Godfrey Kopp	400 – –	

(1.)

RETURN of all Pictures purchased out of the interest accruing from the Sum of 10,000*l.* bequeathed to the NATIONAL GALLERY by Mr. *Thomas Denison Lewis.* (*See* Director's Annual Report for 1864).

925	Landscape, Cornard, Suffolk	Gainsborough	1875	Mr. Watts Russell	1,207 – –	Sale by auction.
926	The Windmill	Crome, John (old)	—	ditto	231 – –	Sale by auction.
1021	A Woman's Portrait	Hals, Frans	1876	Mr. F. A. Keogh	105 – –	
1036	Portrait of a Gentleman	Unknown	1878	Mr. W. Fuller Maitland.	350 – –	
1040	Landscape, River and Rocks	Müller, W. J.	—	ditto	300 – –	
1042	Portrait of a Gentleman	Hemessen, C. van	—	Mr. James C. Wallace	60 – –	
1147	Heads of Four Nuns	Lorenzetti, A.	—	Cav. P. Lombardi	45 – –	Fragment of a fresco.
1133	The Nativity	Signorelli, L.	1882	Sigr. S. Bardini	1,200 – –	
1141	Portrait of a Young Man	Antonello da Messina	1883	Mr. F. Y. Brown	1,040 – –	
1192	Design for an Altar-piece	Tiepolo, G. B.	1885	From the Beckett Denison Collection.	162 15 –	Sale by auction.
1193	Design for an Altar-piece	Tiepolo, G. B.	1885	From the Beckett Denison Collection.	162 15 –	Sale by auction.
1194	Christ driving out the Traders from the Temple.	Venusti, M.	—	ditto	966 – –	Sale by auction.
1196	Combat between Amor and Castitas	Tuscan School	—	Mr. F. Y. Brown	500 – –	
1208	Portrait of Wm. Godwin, the Author	Opie, John	1886	Mr. C. Campbell Feetum.	150 – –	
1224	Portrait of S. Scott, the Painter	Hudson, T.	—	Mr. R. T. Simpson	65 – –	
1227	The Holy Family	Venusti, M.	1887	Messrs. T. Agnew and Sons.	452 – –	
1278	A Convivial Party	Pot, Hendrik	1889	Messrs. Lake, Beaumont, & Co.	200 – –	
1306	Landscape with Figures and Cattle	Barker, J., of Bath	1890	Mrs. Briggs	130 – –	
1327	A Winter Scene	Goyen, Jan van	1891	Messrs. P. and D. Colnaghi.	335 – –	
1374	Portraits of Hogarth's Servants	Hogarth	1892	Mr. J. K. Wedderburn	162 15 –	
1416	The Virgin and Child	Mazzuola, F.	1894	Mr. C. Fairfax Murray.	120 – –	
1427	The dead Christ: a Pietà	Baldung, Hans	—	Mr. George Donaldson.	600 – –	
1428	A View of Southampton	Lancaster, H.	—	Messrs. P. and D. Colnaghi.	84 – –	

(2.)

RETURN of all PICTURES purchased out of a pecuniary Bequest (2,612*l.* 4*s.* 8*d.*) made to the NATIONAL GALLERY by Mr. *Richard Charles Wheeler.* (*See* Director's Annual Report for 1878.)

No. in the Gallery.	Subject of Picture.	Painter.	Date of Purchase.	Former Proprietor.	Price.	REMARKS.
					£. *s.* *d.*	
1037	Slate Quarries	Crome, John (old)	1878	Mr. W. Fuller Maitland.	500 – –	
1039	A Landscape	Barker, J., of Bath	—	ditto	100 – –	
1156	On the Ouse, Yorkshire	Arnald, G.	1884	Messrs. H. Graves & Co.	105 – –	
1158	View of Harlech Castle	Ward, J.	—	Messrs. A. Myers and Son.	350 – –	
1161	Portrait of Miss Fenton	Hogarth	—	From the Leigh Court Collection.	840 – –	Sale by auction.
1162	The Shrimp Girl	ditto	—	ditto	262 10 –	Sale by auction.
1204	The Valley of the Yare, Norwich	Stark, J.	1886	The Painter's Son	400 – –	
1328	View of Westminster	Scott, S.	1891	Messrs. P. and D. Colnaghi.	70 – –	Of this amount, 15*l.* 5*s.* 4*d.* was paid out of the interest of the Lewis Fund.

(3.)

RETURN of all PICTURES purchased out of the interest accruing from the sum of 23,104*l.*, bequeathed to the NATIONAL GALLERY by Mr. *Francis Clarke.* (*See* Director's Annual Report for 1879.)

1130	Christ washing the feet of His disciples.	Robusti, J., called Tintoretto.	1882	The Duke of Hamilton.	157 10 –	Sale by auction.
1131	Joseph and his Kindred in Egypt	Pontormo, J. da	—	ditto	315 – –	ditto.
1132	An Interior	Steenwyck, W.	—	ditto	204 15 –	ditto.
1137	Portrait of a Boy	Dutch School	1883	Miss M. A. Thomas	840 – –	
1139	The Annunciation	Duccio di Buoninsegna.	—	Mr. C. Fairfax Murray.	178 – –	
1140	Christ healing the Blind	Duccio di Buoninsegna.	—	Mr. C. Fairfax Murray.	178 – –	
1166	The Crucifixion	Antonello da Messina	1884	Marchioness of Waterford.	350 – –	
1167	Portrait, said to represent Mary Wollstonecraft.	Opie, J.	—	Mr. William Russell	231 – –	Sale by auction.
1168	Portrait of a Jesuit	Vliet, W. van der	—	ditto	241 10 –	ditto.
1173	An unknown subject	Giorgione, School of	1885	From the Bohn Collection.	135 – –	ditto.
1188	The Betrayal of Christ	Ugolino da Siena	—	From the Fuller Russell Collection.	26 5 –	ditto.
1189	The Procession to Calvary	Ugolino da Siena	—	From the Fuller Russell Collection.	26 5 –	ditto.
1195	The Birth of Venus	Rubens	—	From the Beckett Denison Collection.	672 – –	ditto.
1217	The Israelites gathering Manna	Roberti, Ercole de'	1886	The Earl of Dudley	650 – –	
1223	View of a portion of Old Westminster Bridge.	Scott, S.	—	Messrs. H. Graves & Co.	15 15 –	
1233	The Blood of the Redeemer	Bellini, Giov.	1887	Mr. C. Fairfax Murray.	472 10 –	
1234	A Muse inspiring a Court Poet (?)	Dosso Dossi	—	ditto	157 10 –	
1248	Portrait of a Lady	Helst, B. van der	1888	Colonel Everett	189 – –	Sale by auction.
1249	Portrait of Endymion Porter	Dobson, W.	—	From the Gatton Park Collection.	420 – –	ditto.
1267	Portrait of a Young Woman	Græco Roman, 2nd or 3rd Century.	—	Mr. W. Flinders Petrie.	95 – –	Discovered in an ancient cemeat Hawara, in the Fayûm Egypt.
1268	Portrait of a Young Man	Græco Roman, 2nd or 3rd Century.	—	Mr. W. Flinders Petrie.	95 – –	Discovered in an ancient cemeat Hawara, in the Fayûm Egypt.
1269	Portrait of a Young Woman	Græco Roman, 2nd or 3rd Century.	—	Mr. W. Flinders Petrie.	95 – –	Discovered in an ancient cemeat Hawara, in the Fayûm Egypt.
1270	Portrait of a Young Woman	Græco Roman, 2nd or 3rd Century.	—	Mr. W. Flinders Petrie.	95 – –	Discovered in an ancient cemeat Hawara, in the Fayûm Egypt.
1283	View of Dedham	Gainsborough	1889	Messrs. T. Agnew and Sons.	209 9 6	
1284	St. Francis and St. Mark	Vivarini, Ant.	—	Dr. Jean P. Richter	200 – –	
1292	A Family Group	Bylert, J. van	—	Messrs. Deprez and Gutekunst.	50 – –	
1293	Musical Pastime	Molenaer, J. M.	—	Messrs. P. and D. Colnaghi.	126 – –	
1317	The Marriage of the Virgin	Tuscan School	1890	Mr. A. Borgen	70 – –	
1333	The deposition from the Cross	Tiepolo, G. B.	1891	From the Cavendish-Bentinck Collection.	157 10 –	Sale by auction.
1334	"The Fortune-Teller"	Longhi, P.	—	ditto	105 – –	ditto.

3. RETURN of all Pictures purchased out of the interest accruing from the sum of 23,104*l.*, bequeathed to the National Gallery by *Mr. Francis Clarke*, &c.—*continued.*

No. in the Gallery.	Subject of Picture.	Painter.	Date of Purchase.	Former Proprietor.	Price.	REMARKS.
					£. s. d.	
1335	The Madonna	French School	1891	Miss Sorel	50 — —	
1385	Beatrix Knighting Esmond	Egg, A. L.	1893	Mr. A. D. Hogarth	105 — —	
1388	"The Cast Shoe"	Mason, Geo.	—	Mr. J. Stewart Hodgson.	682 10 —	Sale by auction.
1389	Chilston Lane, Torquay	Wilcock, G. B.	—	Messrs. H. Graves & Son.	50 — —	
1405	Edfou, Upper Egypt	Lewis, J. F.	1894	Messrs. Agnew & Sons.	850 — —	

(B.)

RETURN of all PICTURES, &c., presented to the NATIONAL GALLERY, giving the Date of Presentation, Name of the Donor (whether by Gift or Bequest), Name of the Painter, and the Subject, from 1885 to 1894 inclusive (in continuation of the Return to the Order of the House of Lords, dated the 13th day of July 1869).

1. PICTURES PRESENTED.

No. in the Gallery.	Subject of Picture.	Painter.	Donor.	Date of Presentation.	REMARKS.
1190	Portrait of a Boy	Clouet (ascribed to)	Mr. G. F. Watts, R.A.	1885	
1191	The Loss of H.M.S. "Royal George."	Schetky, J. C.	The Misses Trevenen	—	
1198	Portrait of Mr. H. Byne	Abbott, Lemuel F.	Miss C. C. Lippincott	—	
1205	Landscape	Bridell, F. R.	Mrs. Bridell-Fox	1886	
1207	The Hay-wain	Constable, J.	Mr. Henry Vaughan	—	
1215	The Virgin and Child	Veneziano, D.	The Earl of Crawford and Balcarres.	—	
1216	Three fragments of a fresco representing the Fall of the Rebel Angels.	Spinello Aretino	The Right Honourable Sir Henry Layard.	—	
1222	A Study of Foliage, &c.	Hondecoeter, M. de	Mr. J. W. Shaw	—	
1228	Titania and Bottom	Fuseli	Miss J. Carrick Moore	1887	
1229	The Virgin and Child	Morales, L. de	Mr. G. F. de Zoete	—	
1235	View of the House in which the Artist was Born.	Constable, J.	Miss Isabel Constable	—	
1236	"The Salt-box," Hampstead Heath	ditto	ditto	—	
1237	A View on Hampstead Heath	ditto	ditto	—	
—	A Palette used by J. Constable, R.A.		ditto	—	
1244	The Bridge at Gillingham	Constable, J.	ditto	1888	
1245	Church Porch, Bergholt				
1246	A House at Hampstead				
1253	View of Hyde Park Corner	Holland, J.	Miss Emily J. Wood	—	
1254	View of Hyde Park Corner	Unknown			
—	Sketch of Harlech Castle	Cox, D.	Miss J. E. Gordon	—	Water-colour drawings. Hung in one of the lower rooms of the Gallery.
—	Sketch of a Harbour				
—	Study for a Sea-piece	Varley, J.			
—	Study for a Sea-piece				
—	A Cottage Fire-side at Puckaster	Wilkie, Sir D.			
—	Sketch in Spain	Lewis, J. F.			
1255	A Study of Still Life	Velde, Jan J. van de	The Right Honourable Lord Savile, G.C.B.	—	Hung in one of the lower rooms of the Gallery.
1256	A Study of Still Life	Steenwyck, H.			
1257	The Nativity of the Virgin	Murillo, B. E.			
1258	A Study of Still Life	Chardin, J. B. S.			
—	Fifty-nine copies, painted (on a reduced scale) by Mr. Chidley Molony from pictures by Velazquez, in the Prado Gallery at Madrid.				
—	Forty copies, painted (on a reduced scale) by Herr Paul Roemer, from pictures by Rembrandt, in the Imperial Gallery of the Hermitage, St. Petersburg.				

(B.)—RETURN of all Pictures, &c., presented to the National Gallery, giving the Date of Presentation, Name of the Donor (whether by Gift or Bequest), &c.—*continued.*

No. in the Gallery.	Subject of Picture.	Painter.	Donor.	Date of Presentation.	REMARKS.
1260	Portrait of a Woman	Græco Roman 2nd or 3rd Century.	Mr. H. Martyn Kennard	1888	
1261	Portrait of a Young Woman				
1262	Portrait of a Young Woman				
1263	Portrait of a Young Woman				
1264	Portrait of a Young Man				
1265	Portrait of a Man	ditto	Mr. J. Haworth	—	
1266	Portrait of a Young Woman				
1271	Portrait of a Young Man	Gainsborough	Mr. James R. Swinton	—	
1277	A Man's Portrait	Maes, N.	Sir Theodore Martin, K.C.B.	—	
1279	"Beata Beatrix"	Rossetti, D. G.	Lady Mount Temple	1889	
1281	Portrait of Mrs. Brocas	Cotes, Francis	Mr. George Holt	—	
1282	St. Zenobio restoring a Dead Child to Life.	Empoli, J. da	Mr. George Salting	—	
1285	Portrait of Napoleon I.	Vernet, Emile J.	The Duke of Leinster	—	
1294	An Allegorical Subject	Poorter, W. de	Mr. T. Humphry Ward	—	
–	Thirty-four Drawings and Sketches, chiefly in pencil, by the late Mr. Wells.		Mrs. Wells	—	
1301	Portrait of Girolamo Savonarola	Tuscan School	Dr. William Radford	1890	
1308	A Man's Portrait	Mazo, Martinez J. B. del.	Mr. C. H. Crompton Roberts.	—	
1320	Portrait of Aglonius Voon	Janssens, C.	Mrs. Zouch Troughton	1891	
1321	Portrait of Cornelia Remoens				
1322	The Eve of the Deluge	Scott, W. B.	Miss Alice Boyd	—	
1325	"Respect"	Veronese, Paolo	The Earl of Darnley	—	
1330	The Transfiguration	Duccio di Buoninsegna.	Mr. Robert H. Wilson	—	
1331	The Virgin and Child surrounded by Cherubim.	Fungai	Mr. William Connal, jun.	—	
1332	Supposed Portrait of George First Earl of Berkeley.	Netscher, C.	The Right Hon. Lord Savile, G.C.B.	—	
–	A Series of Sketches for the finished picture (numbered 1163 in the National Gallery) of "The Pilgrimage to Canterbury."	Stothard	Mr. Henry Vaughan	—	
1380	Fruit and Flowers	Os, Jan van	Mr. George Holt	1892	
1382	"Salvator Mundi"	Jackson, J.	The Rev. John Gibson	—	Drawn in pencil. Executed in pen and ink.
–	Study of a Human Skull	Hogarth			
–	Sketch of a Man's Head				
1391	The Harbour of Refuge	Walker, F.	Mr. William Agnew	1893	
1392	Cardinal Bourchier and the Widow of Edward IV.	Bell, John Z.	The Painter's Widow	—	
1393	View of a Mediterranean Seaport.	Vernet, C. J.	Mrs. Tarratt	—	
1394	Christ Washing St. Peter's Feet	Brown, Ford Madox	A Body of Subscribers	—	
1397	An Old Woman Sewing	Dutch School	Mr. Henry J. Pfungst	1894	
1404	Portrait of James Northcote, R.A.	Jackson, J.	The Earl of Carlisle	—	
1408	Portrait of a Boy	Opie	Mr. Edward Opie	—	
–	A Porphyry Bust		Mr. H. Yates Thompson	—	
–	A Palette used by the late F. Madox Brown.		Mrs. Hueffer	—	
1417A	An Illuminated Initial Letter	Italian School	The Earl of Northbrook	—	
1422	The Holy Family	Le Sueur	Mr. Francis T. Palgrave	—	
1423	Portrait of a Lady	Ravesteijn, Jan A.	Mr. A. Fowell Buxton	—	
1425	A Portrait Group	Le Nain	Mr. Lesser Lesser	—	
1426	St. John Leading the Virgin Mary from the Tomb.	Dyce, W.	Anonymous	—	
1430	An Architectural Subject with Figures.	Beccafumi, D.	Mr. George Salting	—	

(B.)—RETURN of all Pictures, &c., presented to the National Gallery, giving the Date of Presentation, Name of the Donor (whether by Gift or Bequest), &c.—*continued.*

2. PICTURES BEQUEATHED.

No. in the Gallery.	Subject of Picture.	Painter.	Donor.	Date of Bequest.	REMARKS.
1169	Portrait of Mrs. R. Hollond	Scheffer, Ary	Mr. Robert Hollond	1885	
1170	St. Augustine and St. Monica	ditto			
1174	The Watering Place	Gainsborough, T.	Mrs. Elizabeth Vaughan	—	
1175	Regent's Park, 1807	Ward, J.			
1176	Landscape	Nasmyth, P.			
1177	Landscape				
1178	Landscape				
1179	Landscape				
1180	Cliveden-on-Thames	Turner, J. M. W.			
1181	A Sea Shore Scene	Mulready, W.			
1182	A Scene from Milton's "Comus"	Leslie, C. R.			
1183	Landscape	Nasmyth, P.			
1184	A Fruit-Piece	Lance, G.			
1185	Nymphs and Satyrs	Stothard, T.			
1186	Landscape, with Cattle	Glover, W.			
1187	A Sketch of Rustic Figures	Wilkie, Sir D.			
1197	Portrait of David Garrick, the Actor.	Zoffany, ascribed to	Mr. Nathan David Garrick.	—	
1206	Landscape and Figures	Rosa, Salvator	Mrs. L. Frederica Ricketts.	1886	
1225	Portrait of the Artist's Father and Mother.	Webster, T.	The Painter	—	
1226	"A Distinguished Member of the Humane Society."	Landseer, Sir E.	Mr. Newman Smith	1887	
1238	Portrait of Sir Samuel Romilly	Lawrence, Sir T.	Mr. Charles Romilly	—	
1250	Portrait of Charles Dickens	Maclise, D.	The Rev. Sir Edward R. Jodrell, Bart.	1888	
1251	A Man's Portrait	Hals, F.	Mr. Decimus Burton	—	
1252	A Fruit-Piece	Snyders, F.			
1272	The Cenotaph	Constable, J.	Miss Isabel Constable	—	
1273	Flatford Mill on the Stour				
1274	The Glebe Farm				
1275	View at Hampstead				
1276	Harwich: Sea and Lighthouse				
1286	A Boy Drinking	Murillo, B. E.	Mr. John Staniforth Beckett.	1889	
1287	Interior of an Art Gallery	Dutch School			
1288	A Frost Scene	Neer, A. van der			
1289	Landscape, with Figures	Cuyp, A.			
1290	Landscape, with Figures	Wilson, R.			
—	A Lake-side Scene	Müller, W. J.	Mr. Leonard S. Pratten	—	Water-colour drawing.
1307	Portrait of Miss C. Fry	Lawrence, Sir T.	Mr. William Wilson	1890	
1323	Portrait of Piero de Medici	Bronzino	Sir William Drake	1891	
1349	Study of a Lion	Landseer, Sir E.	Mr. Thomas H. Hills	1892	
1350	Study of a Lion				
1351	Door of a Village Inn	Morland, G.	Sir Oscar M. P. Clayton	—	
—	"Rosa Triplex"	Rossetti, G. C. D.	Mr. John J. Lowndes	—	Crayon drawing
1352	Landscape, with Ruins	Moucheron, F. de	Mr. Richard W. Cooper	—	
1353	Landscape, with Satyrs	Ryckaert, M.			
1354	Portrait of Sir A. Cockburn	Unknown	Marianna Augusta, Lady Hamilton.	—	
1355	Portrait of Dr. Cockburn				
1356	Portrait of William Cockburn				
1357	Portrait of Lady Stewart				
1358	Portrait of Sir J. Stewart				
1359	Portrait of Sir J. Cockburn				
1360	Portrait of Sir T. Lyttelton	Wilson, R.			
1361	Portrait of Sir R. Lyttelton	Battoni, P. G.			
1362	Portrait of Lord Lyttelton	Brompton, R.			
1363	Portrait of Mrs. Ayscough	Unknown			

B.—RETURN of all Pictures, &c., presented to the National Gallery, giving the Date of Presentation, Name of the Donor (whether by Gift or Bequest), &c.—*continued.*

No. in the Gallery.	Subject of Picture.	Painter.	Donor.	Date of Bequest.	REMARKS.
1364	Portraits of the two Sons of Frederick Prince of Wales, 1748, with their Tutor, Dr. Ayscough.	Wilson, R.	Marianna Augusta, Lady Hamilton.	1892	
1365	Portraits of Lady Cockburn and her Children.	Reynolds, Sir J.			
1366	Portrait of Sir J. Cockburn	Devis, A. W.			
1367	Portrait of Sir J. Cockburn	Morton, A.			
1368	Portrait of Lady Cockburn	Morton, A.			
1369	Portrait of Marianna A. Cockburn.	Devis, A. W.			
1370	Portrait of Marianna Augusta, Lady Hamilton.	Morton, A.			
1371	Portraits of Sir J. Cockburn and his Daughter.	Zoffany, J.			
1372	Portrait of Sir G. Cockburn	Halls, J. J.			
1373	Portrait of Captain G. E. Ayscough.	Unknown			
1375	Christ in the House of Martha	Velazquez			
1376	Sketch of a Duel in the Prado	ditto	The Right Honourable Sir William H. Gregory.	—	
1377	The Adoration of the Shepherds	Savoldo, Giov. G.			
1378	An Interior	Steen, Jan			
1379	The Rat-catcher	Woodward, T.	Mr. Edward Archer	—	
1381	The Holy Women at the Sepulchre.	Mantegna, F.	Lady Taunton	—	
1384	A View in Hampshire	Nasmyth, P.	Colonel Alexander B. Read.	1893	
1395	Portrait of Mrs. C. H. Bellenden Ker.	Eastlake, Sir C. L.	Mr. Charles H. Bellenden Ker.	—	
1398	"Ippolita Torelli"	ditto	Lady Eastlake	1894	
1413	Portrait of Mr. P. Sansom	Lawrence, Sir T.	Miss Ellen Sansom	—	
1414	Portrait of P. Sansom as a Child	Westall, R.			
1424	Tobias and the Angel	Elsheimer, A.	Mr. Samuel Sandars	—	

NATIONAL GALLERY.

COPY of the ANNUAL REPORT of the DIRECTOR OF THE NATIONAL GALLERY to the TREASURY, for the Year 1894.

(*Sir John Hibbert.*)

Ordered, by The House of Commons, *to be Printed*
1 *April* 1895.

[*Price* 3 *d.*]

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NATIONAL PORTRAIT GALLERY.

THIRTY-EIGHTH ANNUAL REPORT

OF THE

TRUSTEES OF THE NATIONAL PORTRAIT GALLERY.

1895.

Presented to Parliament by Command of Her Majesty.

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1895.

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THIRTY-EIGHTH ANNUAL REPORT

OF THE

TRUSTEES OF THE NATIONAL PORTRAIT GALLERY.

1895.

TO THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

The Trustees of the National Portrait Gallery have the honour to submit herewith their Thirty-eighth Annual Report to the Lords Commissioners of Her Majesty's Treasury.

The Trustees desire to record their deep sorrow and regret at the losses sustained by their Board since the publication of their last Report through the deaths of Viscount Hardinge, Chairman of the Board, Sir George Scharf, K.C.B., formerly Director, Keeper and Secretary and more recently Trustee, and the Earl of Pembroke, and the resignation of Sir Charles Tennant, Bart.

Charles Stewart Hardinge, Viscount Hardinge, was elected a Trustee on July 25, 1868 in the room of Mr. Thomas Carlyle. He took a constant personal interest in the affairs of the National Portrait Gallery, and on the lamented death of Earl Stanhope in 1875, was elected unanimously to fill the vacant post of Chairman of the Board. Viscount Hardinge continued to preside over the meetings of the Board, until he was incapacitated by a prolonged illness, which was terminated by his death on 28th July 1894.

At the 207th meeting of the Trustees, the following resolution was carried unanimously, and entered upon the Minutes :—

> "The Trustees of the National Portrait Gallery desire to put on record their deep
> " sorrow at the death of their chairman, Lord Hardinge. Since the death of Lord
> " Stanhope in 1875, he discharged the duties of chairman with the greatest energy
> " and ability.
>
> " He was a regular attendant at the meetings of the Board, and his courtesy
> " and extensive knowledge gained for him the warm sympathy and friendship of his
> " colleagues and of all who were brought into official relation with him as chairman.
> " His distinguished ability as a painter gave special weight to his judgment upon all
> " matters connected with art."

Sir George Scharf, K.C.B., was selected upon the foundation of the National Portrait Gallery in 1857, to fill the post of Secretary to the Gallery, and performed the duties of that post, to which were subsequently added those of Keeper and Director, for 38 years. To sketch the history of Sir George Scharf's career in the service of the Trustees would be to sketch the complete history of the National Portrait Gallery itself, so entirely was he identified with every page in that history, every purchase or acquisition made by the Trustees, and every step, which led from the modest housing of a few portraits at No. 29, Great George Street, Westminster, to the present palatial edifice in St. Martin's Place, W.C., into which the National Collection of Portraits has so recently been received.

In their Thirty-fifth Annual Report for 1892, the Trustees recorded that although Mr. Scharf had been compelled to resign his post through superannuation, the Lords Commissioners of Her Majesty's Treasury had yielded to the strong recommendations of the Trustees, and authorised, by arrangement, the further retention of Mr. Scharf's valuable services.

B 89238. Wt. 14726.

This arrangement was maintained until early in 1895, when continuous ill-health incapacitated Mr. Scharf from the performance of his duties. On relinquishing his post, Mr. Scharf received from Her Majesty the honour of advancement to be K.C.B., and a further recognition of his services was made through his selection by the First Lord of the Treasury to be a Trustee in the room of Viscount Hardinge. Sir George Scharf, K.C.B., however, died on 19th April 1895, without having been able to take his seat at the Board.

At the 211th meeting of the Trustees, the following tribute to the memory of Sir George Scharf, K.C.B., was passed unanimously, and entered upon the Minutes:—

TRIBUTE to the MEMORY of SIR GEORGE SCHARF, K.C.B.

Resolved that—

"The Trustees of the National Portrait Gallery, at this their last meeting in the "temporary offices, 20, Great George Street, Westminster, cannot separate without "placing on record their deep sense of the loss which they have sustained in the "death of Sir George Scharf, K.C.B., late Director, Keeper, and Secretary of the "National Portrait Gallery. At the time of the foundation of the National Portrait "Gallery, in 1857, Mr. George Scharf was selected for the post of first keeper and "secretary to the Gallery. Mr. Scharf had already attained distinction as an artist "and a draughtsman, and had achieved conspicuous success as an art director of the "great Manchester Art Treasures Exhibition in 1857. From the date of his first "appointment to within a few days of his death Mr. Scharf devoted the whole "interest of his life with single-minded energy to discharging the duties of his "post.

"Mr. Scharf was primarily responsible for the selection of the first 982 portraits "secured by the Trustees of the National Portrait Gallery. To this work Mr. "Scharf brought on his own part knowledge and abilities of a remarkable and "extensive character, in addition to an unflagging zeal and industry, all of which "qualities he exercised unabated to the last hour of his life. As secretary to the "Board of Trustees Mr. Scharf attended 208 consecutive meetings, and was only "prevented by bodily infirmity from attending the last meeting held during his "tenure of office. When, on completing the seventieth year of his age Mr. Scharf "came under the rule of the Civil Service with regard to compulsory retirement, "it was the unanimous feeling of the Trustees (as set forth in the Minutes of the "198th meeting of January 11th, 1892) that a special effort should be made to "secure an extension of Mr. Scharf's invaluable services to the National Portrait "Gallery, to which request the Government acceded with pleasure. Mr. Scharf "was thus enabled to continue his duties as director, keeper, and secretary of this "Gallery until increasing sickness and bodily infirmity made it impossible for him to "continue performing them. At their 209th meeting on the 21st March 1895, the "Trustees heard with great pleasure that the Sovereign had been pleased to confer "upon Mr. Scharf the honour of K.C.B. in recognition of his services. The "Trustees subsequently received with equal pleasure the news that the First Lord "of the Treasury had selected Sir George Scharf, K.C.B., as one of their colleagues "in this trust. To the infinite sorrow of the Trustees they were prevented by the "sad event of Sir George Scharf's death from welcoming him as their colleague at "this Board. The Trustees also most deeply regret that they were thus deprived "of the services of Sir George Scharf in supervising the installation of the collec-"tions in the new building, and that his life was not spared long enough to witness "the completion of the great work with which his name will be ever identified. To "this record of the great loss sustained by the National Portrait Gallery by the "death of Sir George Scharf, the Trustees append their own united feeling that, "where the public service has been deprived of a zealous and devoted servant, they "have themselves lost a courteous, genial, and very highly-valued friend."

By his will, Sir George Scharf, K.C.B., bequeathed to the Trustees of the National Portrait Gallery, on trust, the valuable series of note books, 109 in number, in which he had recorded notes and drawings of the countless portraits which had come before his notice during his lifetime. To this bequest he added a selection of books from his library, in which he had been in the habit of making marginal notes or additions with reference to portraits of importance. The executors of Sir George Scharf's will further placed at the disposal of the Trustees a number of volumes from Sir George Scharf's library, which had more or less direct reference to the work of the National Portrait Gallery.

The Trustees have accepted the trust of these sketch books, volumes, &c., which afford not only a most valuable accession to the reference library of the National Portrait Gallery, but a complete record of Sir George Scharf's unflagging industry in the cause to which he had devoted his life.

George Robert Charles Herbert, Earl of Pembroke and Montgomery, was appointed a Trustee on 8th December 1887, in the room of the Right Hon. A. J. Beresford Hope. Adding remarkable personal talents to a high and historic lineage, he showed a constant interest in the affairs of the National Portrait Gallery, but frequent and eventually continuous ill-health rendered him unable to be a regular attendant at the meetings of the Board.

At the 211th meeting of the Trustees the following resolution was carried unanimously and entered on the Minutes :—

> " The Trustees wish to record their deep sorrow at the death of their colleague, " Lord Pembroke, whose loss they much deplore. The Trustees recognise the " great interest always taken by Lord Pembroke in all matters relating to the " National Portrait Gallery."

Sir Charles Tennant, Bart., resigned his trusteeship on being approved a Trustee of the National Gallery. Sir Charles Tennant during the short time he acted on the Board of the National Portrait Gallery showed a great interest in its affairs, which was further marked by his munificent gift of a fine portrait of " Grecian " Williams by Sir Henry Raeburn.

The vacancies thus made upon the Board of Trustees have been filled up by the appointments of William Edward Hartpole Lecky, Esq., the eminent historian, by Treasury letter of 29th May 1895 ; the Hon. Philip Stanhope, M.P., youngest son of Earl Stanhope, the founder of the Gallery and brother of the Trustees' lamented colleague, the Right Hon. Edward Stanhope, M.P., by Treasury letter of 15th June 1895 ; and the Lord Ribblesdale, by Treasury letter of 3rd July 1895.

At the 211th meeting of the Trustees on May 16th, 1895, the Lord De L'Isle and Dudley, who had acted as vice-chairman of the Board since April 20th, 1894, was elected unanimously to be chairman in the room of Viscount Hardinge, deceased, an election approved by the Lords Commissioners of Her Majesty's Treasury in a letter of 28th May 1895.

The Board of Trustees is therefore complete as follows :—

The Lord De L'Isle and Dudley (Chairman).
The Lord President of the Council (for the time being).
The Lord Ronald Gower.
The Lord Edmond Fitzmaurice.
The Viscount Cobham.
The Viscount Dillon.
The Viscount Peel.
The Lord Ribblesdale.
The Hon. Philip Stanhope, M.P.
The Right Hon. William Ewart Gladstone.
Sir Coutts Lindsay, Bart.
The President of the Royal Academy of Arts (for the time being).
Sir John Everett Millais, Bart., R.A.
William Henry Alexander, Esq.
Henry Hucks Gibbs, Esq.
William Edward Hartpole Lecky, Esq.

Since the date of the supplement to their last Report, 14th June 1894, this meeting inclusive, the number of meetings held by the Trustees is six; and from the 9th February 1857, when the Trustees commenced their duties, 213.

The list of 537 donations, as given in their former Reports, may now be continued as follows, as the following list will show, up to 564 :—

538. Hugh William Williams, 1773—1829.

Painted by Sir Henry Raeburn, P.R.S.A.

Water-colour painter and author ; born in Wales ; settled in Edinburgh, where he practised as a water-colour painter ; travelled in Italy and Greece, and from the various

publications of his "Travels," especially those in Greece, and the illustrations from his own drawings, acquired the name of "Grecian Williams."

Presented, 23rd August 1894, by Sir Charles Tennant, Bart. Register Number 965.

539. James Northcote, R.A., 1746—1831.

Painted by George Henry Harlow.

Portrait and historical painter, and writer on art.

Presented, 6th December 1894, by John Carrick Moore, Esq. Register Number 969.

540. Alfred Lord Tennyson, Poet Laureate, 1809—1892.

A chalk drawing from the life by M. Arnault, a French artist.

Presented, 6th December 1894, by Emily, Lady Tennyson. Register Number 970.

541. Thomas Bewick, 1753—1828.

Painted by Thomas Sword Good.

The celebrated wood engraver when advanced in years.

Presented, 6th December 1894, by the Rev. Albert A. Isaacs, M.A., of Corpus Christi College, Cambridge. Register Number 971.

542. William Cowper, 1731—1800.

Painted by George Romney.

The celebrated poet, translator, and letter-writer; born at Great Berkhampstead, Hertfordshire, on 15th November 1731. Author of "The Task," "John Gilpin," and many other poems; died at East Dereham, Norfolk, on 25th April 1800.

This picture formed part of the personal effects, formerly belonging to Romney, sold at Messrs. Christie, Manson, and Woods, on 25th May 1894, and was No. 174 of the Catalogue.

Presented, 6th December 1894, by George Scharf, Esq., C.B., F.S.A. Register Number 972.

543. Sir Charles Thomas Newton, K.C.B., D.C.L., LL.D., 1816—1894.

The original model in plaster by Sir John Edgar Boehm, Bart., R.A., for the bust in the British Museum.

Distinguished archæologist; born 1816; appointed an Assistant in the Department of Antiquities at the British Museum in 1840; appointed Vice-Consul at Mitylene in the Grecian Archipelago in 1852, during which time he carried out works of exploration and excavation of the greatest importance to art and archæology, especially the discovery of the site of the Mausoleum at Halicarnassus, and the acquisition of its sculptures for the British Museum; appointed in May 1860 British Consul at Rome; in 1861 Keeper of the Greek and Roman Antiquities in the British Museum; in 1880 Professor of Archæology at University College, London; died 28th November 1894.

Presented, 21st March 1895, by Miss Amy Frances Yule. Register Number 973.

544. Lieutenant Thomas Waghorn, R.N., 1800—1850.

Painted by Sir George Hayter, R.A.

Discoverer of the Overland Route to India.

Bequeathed, 21st March 1895, by Mary Venn Wheatley. Register Number 974.

545. Colonel Hugh Owen, 1784—1861.

Minature painting by Andrew Robertson.

Born at Denbigh, 23rd May 1784; highly distinguished in active service during the Peninsular War; held a command in the Portuguese Army; died at Banstead, Surrey, on 16th December 1861. Register Number 975.

546. Prince James Francis Edward Stuart (1688—1766) and his sister Princess Louisa Maria Theresa (1692—1712).

Painted as children in 1695 *by Nicolas de Largillière.*

The only children of James II. and Mary of Modena who survived infancy; he was well known as the Chevalier de St. George or the elder Pretender; she died unmarried aged 20, in 1712.

Bequeathed, March 1895, by Horatio William, 4th Earl of Orford. This picture was exhibited at the Stuart Exhibition in the New Gallery, Regent Street, in 1889, being No. 207 of the Catalogue. Register Number 976.

547. Ann Mary Newton, 1832—1866.

Painted by herself.

Distinguished artist; daughter of Joseph Severn, the painter; born at Rome on 29th June 1832; married in 1861 to Mr. Charles T. Newton, the Archæologist; died 2nd January 1866.

Bequeathed, 21st March 1895, by Sir Charles Thomas Newton, K.C.B. Register Number 977.

548. Sir Marc Isambard Brunel, 1769—1849.

Painted in 1813 *by James Northcote, R.A.*

The celebrated civil engineer; born in Normandy on 25th April 1769; inventor of the "block machinery"; constructor of the Thames Tunnel; died 12th December 1849.

Presented, 21st March 1895, by his grandson Henry Marc Brunel, Esq. Register Number 978.

549. Isambard Kingdom Brunel, 1806—1859.

Painted in 1856 *by John Callcott Horsley, R.A.*

Distinguished as a civil engineer, son of Sir Marc Isambard Brunel; born 2nd April 1806; constructor of the Clifton Suspension Bridge, the first ocean steamer between England and America and the Great Eastern steamship; died on 5th September 1859.

Presented, 21st March 1895, by his son Isambard Brunel, Esq., D.C.L. Register Number 979.

550. John Henderson, 1747?—1785.

Painted by his friend Thomas Gainsborough, R.A.

Celebrated actor, known as the "Bath Roscius"; born in March 1747; rival of Garrick; died 25th November 1785; buried in Westminster Abbey.

Presented, 21st March 1895, by his grand-daughter Miss Julia Carrick Moore. Register Number 980.

551. Father Joseph Stevenson, S.J., 1806—1895.

A medallion in plaster by a Scottish Artist.

Born 1806; biographer of Mary Queen of Scots; a leading member of the Church of Rome in England; died 8th February 1895, the anniversary of the execution of Mary Queen of Scots.

Presented, 21st March 1895, by Everard Green, Esq., F.S.A., Rouge Dragon Pursuivant at Arms, but reserved until the expiration of 10 years from the death of Father Stevenson. Register Number 982.

552. James Macpherson, 1736–1796.

An early copy from the painting by Sir Joshua Reynolds, P.R.A., in the collection of Lord Leconfield at Petworth.

The compiler or author of the Poems of Ossian; born 27th October 1736; known also as a political writer; died February 1796; buried in Westminster Abbey.

Presented, 9th May 1895, by Henry Willett, Esq., of Brighton. Register Number 983.

553. Sir George Scharf, K.C.B., 1820–1895.

Painted in 1886 *by W. W. Ouless, R.A.*

The late esteemed Director, Keeper and Secretary, and for a short time one of the Trustees of the National Portrait Gallery.

This portrait was presented to the Trustees of the National Portrait Gallery on 24th March 1886, by a number of Mr. Scharf's personal friends as a permanent record of his untiring labours in the interests of the National Portrait Gallery, and was accepted by the Trustees to be placed in their boardroom with a view of its being eventually included among the general collection of National Portraits. At their meeting on 27th June 1895, it was resolved unanimously by the Trustees that the portrait of Sir George Scharf should now be incorporated in the general collection, as a mark of honour and respect to their deceased friend and colleague. Register Number 985.

554. Edward Bird, R.A., 1772–1819.

Plaster cast from a marble bust by Sir Francis Chantrey, R.A., in the University Galleries, Oxford.

Painter of *genre* and history and royal academician; born at Wolverhampton 12th April 1772; died at Bristol 2nd November 1819.

Presented, 27th June 1895, by the executors of the late George Wallis, F.S.A. Register Number 986.

555. Christina Georgina Rossetti (with her mother Frances Mary Lavinia Rossetti), 1830—1894.

Two heads in tinted crayons drawn by Dante Gabriel Rossetti in 1877.

The eminent poetess; born in London 1830; daughter of Gabriele Rossetti, professor of Italian in King's College, London, and commentator on Dante, and Frances Mary Lavinia Polidori (1800—1886), his wife; authoress of "Goblin Market," "The Prince's Progress," and other poems; died in London 29th December 1894.

Presented, 12th September 1895, by her brother William Michael Rossetti, Esq. Register Number 990.

556. John William Polidori, M.D., 1796—1821.

An oil painting, painter uncertain.

Physician and author; born in London 1796 of Tuscan parentage; M.D. of Edinburgh, 1815; travelling physician and secretary to Lord Byron during his residence on the Lake of Geneva; author among other works in prose and poetry of "The Vampyre," a tale suggested by one of a similar name commenced by Byron himself; died in 1821.

Presented, 12th September 1895, by his nephew William Michael Rossetti, Esq. Register Number 991.

The following seven marble busts have been deposited with the Trustees of the National Portrait Gallery by the Trustees of the National Gallery, and transferred, 12th September 1895 :—

557. Richard, Marquess of Wellesley.

By John Bacon, R.A.

Register Number 992.

558. Sir Walter Scott, Bart.

By Sir Francis Chantrey, R.A.

Register Number 993.

559. Right Hon. George Canning.

By E. H. Baily, R.A. from a bust by J. Nollekens, R.A.

Register Number 994.

560. Sir Isaac Newton.

By E. H. Baily, R.A., from a bust by Roubiliac.

Register Number 995.

561. Dr. Samuel Johnson.

By E. H. Baily, R.A., from a cast.

Register Number 996.

562. Arthur, Duke of Wellington.

By E. H. Baily, R.A., from a bust by J. Nollekens, R.A.

Register Number 997.

563. Grace Darling.

By D. Dunbar.

Register Number 998.

564. A large painting, representing "The Trial of Queen Caroline in the House of Lords," *painted by Sir George Hayter, R.A.*, has been received on loan by the Trustees from Luke, Lord Annaly.

This painting was executed in 1823 by Sir George Hayter for George Welbore Ellis, First Lord Dover. It contains a great number of portraits of the leading personages of the time, and the accompanying key renders it of great historical interest. The picture is also well-known from the engraving by J. Bromley.

Received by the Trustees, 12th September 1895. Register Number 999.

In the previous Report the purchases were stated to amount to 487. They may now be continued, as the following list will show, to 495 :—

488. Constantine John Phipps, Lord Mulgrave, 1744—1792.

Drawn by John Downman, A.R.A.

The Arctic Explorer; born in 1744; entered the naval service early in life; undertook a voyage to the North Pole in 1773, of which he published an account; died at Liège in 1792.

Purchased, June 1894, for 25*l.* Register Number 966.

489. William Wilkie Collins, 1824—1889.

Painted by Sir John Everett Millais, Bart., R.A.

The well-known novelist; son of William Collins, R.A.; born in London January 1824; author of many works of fiction, including "The Woman in White," "The Moonstone," "Armadale," &c.; died 23rd September 1889.

Purchased, August 1894, for 52*l.* 10*s.* Register Number 967.

490. Thomas Carlyle, 1795—1881.

Unfinished painting by Sir J. E. Millais, Bart., R.A.

The famous essayist, philosopher, and historian; born at Ecclefechan N.B. on 4th December 1795; died in Cheyne Row, Chelsea, on 10th February 1881; author of "Sartor Resartus," "Heroes and Hero-Worship," "Life and Letters of Oliver Cromwell," "Life of Frederick II.," &c.; a Trustee of the National Portrait Gallery from 1857 to 1868.

Purchased, August 1894, for 350*l.* Register Number 968.

491. John Raphael Smith, 1752—1812.

Drawn in crayons by himself.

Painter and mezzotint-engraver; born 1752; engraver to the Prince of Wales; engraved many plates in mezzotinto after G. Morland; drew well in black and red chalk, and painted portraits; died 1812.

Purchased, March 1895, for 20*l.* Register Number 981.

492. Captain James Cook, 1728—1779.

Marble bust sculptured by Le Vieux.

The well-known circumnavigator; son of a labourer; born in 1728; famous for his voyages, and the results obtained from them; murdered in Hawaii on 13th February 1779.

Purchased, 9th May 1895, for 14*l.* Register Number 984.

493. Portrait Group of Sir Joshua Reynolds, P.R.A., 1723—1792; Sir William Chambers, R.A., 1726—1796; and Joseph Wilton, R.A., 1722—1803.

Painted in 1782 *by John Francis Rigaud, R.A.*

This portrait group of three well-known artists, Reynolds the painter, Chambers the architect, and Wilton the sculptor, was exhibited at the Royal Academy in 1782 as "Portraits of Three English Artists," intended as a "pendant" to the "Portraits of Three Italian Artists" (Bartolozzi, Carlini, and Cipriani), exhibited by Rigaud two or three years before. The three English artists in question were personal friends of the painter. Sir William Chambers, R.A., of whom a portrait by Sir Joshua Reynolds is already in the collection, was the well-known architect of Somerset House. Joseph Wilton, sculptor and royal academician, became Keeper of the Royal Academy in 1790.

Formerly in the Angerstein and James Price collections, and described erroneously in the sale catalogue of the latter collection at Messrs. Christie's on the 15th June 1895, as a "Portrait group of Sir Joshua Reynolds, Sir William Chambers, and John Bacon, R.A."

Purchased, 27th June 1895, for 640*l.* 10*s.* Register Number 987.

494. Horace Walpole, 4th Earl of Orford, 1717—1797; and

495. Thomas Gray, 1716—1771.

Painted by John Giles Eccardt in 1747.

The celebrated author and amateur of the fine arts, and the celebrated poet and scholar.

These two portraits belong to a series of small portraits painted by Eccardt at Strawberry Hill, for Horace Walpole himself. The attitude is in each case copied from one of the well-known portraits in the "Centum Icones," or "Iconographie" of Van Dyck, the "Walpole" being copied from the "Simon Vouet," and the "Gray" from the "Liberti" in the said collection. The portrait of Gray was engraved by Heath in the quarto edition of Lord Orford's works, 1798, Vol. V., page 353, and again by W. Greatbatch in Cunningham's edition of Walpole's letters (1861), and the portrait of Walpole was lithographed as a frontispiece to the Strawberry Hill Catalogue, 1842, and also engraved by W. Greatbatch in Cunningham's edition of Walpole's letters.

The two portraits were sold at the Strawberry Hill sale to the Rev. H. G. Cholmondeley from whom they descended to their late possessor the Rev. Canon F. V. Thornton.

Purchased, 27th June 1895, for 30*l.* and 20*l.* respectively. Register Numbers 988 and 989.

The following four pictures have been cleaned:—

John Martin.
Prince of Orange.
Lord Paget.
Wilkie Collins.

B 89238.

The following six pictures have been put under glass :—

Prince of Orange.
Lord Paget.
John Martin.
Lord Mulgrave.
Wilkie Collins.
William Cowper.

The following six portraits have been copied in oils :—

Henry VIII.
Lady Hamilton (twice).
George III.
Duke of Marlborough.
Sir David Wilkie.
Mrs. Siddons.

The following 40 pictures and busts have been photographed :—

Viscount Sidmouth.
Right Hon. W. Windham.
Charles II.
Duke of Albemarle.
Douglas Jerrold.
Lord Lovat.
William Pitt (twice).
Duke of Monmouth.
Anne Clifford.
Countess of Pembroke.
John Wilkes.
R. B. Sheridan.
Lord Nelson.
Warren Hastings.
C. J. Fox (twice).
William Wilberforce.
George III.
James Watt.
Lord Thurlow.
Sir P. Francis (twice).
Reformed Parliament.
Keats (twice).
Dr. Harvey.
Ludowicke Muggleton.
William Huntington.
Angelica Kauffman.
Mrs. Damer.
Lord Mansfield.
Edmund Burke.
Robert Southey.
Sir W. Scott (twice).
Richard Arkwright.
J. P. Curran.
Wellington.
George Washington.
Oliver Goldsmith.
B. Franklin.
John Wesley.
Henry Grattan.
Lord Clive.

ESTABLISHMENT.

In view of the increase in the establishment, which will be rendered necessary by the removal of the collections into the new building and the arrangements for their supervision, when opened to the public, the establishment is stated in the Estimates for 1895–6 to be under revision.

Early in the year 1895 the Director, Mr. Scharf, C.B., through failing health, was compelled to relinquish his post in the service of the Trustees. He had performed the duties of Secretary, and subsequently those of Keeper and Director of the Gallery since its foundation, and since 1892, when he came under the superannuation clause of the Order in Council of 15th August 1890, had been in receipt of a special allowance to enable him to continue to perform them.

Mr. Scharf, on his resignation, was made a K.C.B. as recorded above, and, in consideration of his unrivalled knowledge and experience, he was further awarded a special gratuity up to September 1895, in order that he might give the benefit of his advice and supervision to the new Director during the removal of the collections and their re-arrangement in the new building. This intention was, however, unfortunately frustrated by his death.

By Treasury letter of April 9th, 1895, Mr. Lionel Henry Cust, M.A., F.S.A., a Second-class Assistant in the Department of the Prints and Drawings at the British Museum, was appointed Director, Keeper, and Secretary in the place of Sir George Scharf, K.C.B., at a salary of 500*l*., 20*l*., 600*l*.

The duties of the clerk to the Gallery, a post which had remained vacant since the death of Mr. L. G. Holland in August 1893, have been continued to be discharged in a temporary capacity by Mr. J. D. Milner, a clerk of the Second Division of the Civil Service. Mr. Milner, who has performed these duties to the satisfaction of the Trustees, was, after receiving a certificate from the Civil Service Commissioners, appointed to be clerk to the National Portrait Gallery in the place of Mr. L. G. Holland, deceased, the appointment dating from 4th September 1895.

Two curators have been added to the staff, and appointed under Clause VII. of the Order in Council of 4th June 1870. These two men, Oliver Huggins and Thomas Evans, were specially recommended by the Trustees on account of their previous

experience in dealing with pictures and similar objects, and other testimonials to their fitness for such duties. They have received certificates from the Civil Service Commissioners, and their appointments date from 30th August 1895.

Two charwomen were employed at Great George Street until the house was vacated, when their services were dispensed with, as the new building was still in the hands of the architect. One charwoman has since been employed in the new building from 8th July 1895, to attend to the Board room and Secretary's room, now in occupation.

The Trustees take this opportunity of recording their earnest desire that, when the establishment is under final revision, provision may be made for relieving the Director of some considerable part of his duties as Secretary and Accounting Officer, in order that he may be able to devote more of his time and interest to the care and development of the collections under his care.

POLICE.

The services of a non-resident watchman at 20, Great George Street were dispensed with after 31st March 1895, and the services of three police constables were sanctioned by Treasury letter of 24th April 1895, to guard the premises continuously by night and by day.

Upon the removal of the collections to the new building, the services of three police constables were continued under sanction of Treasury letter of 25th June 1895. It being, however, found that the number was inadequate for the protection of the new building, the number was increased to six, sanction being given by Treasury letter of 22nd July 1895.

THE NEW BUILDING.

The Trustees wish to record their sorrow at the death of Mr. Ewan Christian, architect to the new building, which took place on 21st February 1895, and their deep regret that neither he nor Sir George Scharf, who had been so intimately associated together in the progress of the building, should have lived long enough to see its completion. The work has been carried on at the desire of Mr. Alexander, the munificent donor, by Mr. John Henry Christian.

The present Director, hearing from Mr. J. H. Christian that, although unfinished in many details, the building was sufficiently far completed to allow of the removal of the collections into it, decided after consultation with the Trustees to proceed without further delay to the long anticipated work of the removal of the portraits and other objects from Bethnal Green, Great George Street, and the National Gallery, and their re-union in the new Gallery.

After consultation with Her Majesty's Office of Works, and after receiving from the Department of Science and Art an intimation that they were prepared to deliver up the collections in their charge at the Bethnal Green Museum, the Director commenced the work of removing the furniture, &c. from No. 20, Great George Street, on Wednesday 5th June 1895, this work being carried out by Her Majesty's Office of Works.

The removal of the pictures, busts, &c. at No. 20, Great George Street was commenced by Mr. Draper, the Gallery agent, on Tuesday 11th June.

The premises at No. 20, Great George Street were entirely vacated on Saturday 15th June, and handed over to Her Majesty's Office of Works.

The removal of the portraits, busts, &c. from the Bethnal Green Museum was commenced by the Department of Science and Art, delivery being made to the Director at the new building. The work was carried on continuously day by day, and the whole of the collections in the care of the Department of Science and Art were handed over to the Director by Saturday, 29th June.

The pictures and sculpture temporarily stored in the basement of the National Gallery were removed into the new building a few days later.

The removal of the collections from Bethnal Green was carried out by the Department of Science and Art with the greatest care and precision, and the objects sustained no injuries, except of the most trifling nature and such as are inevitable during the transit of such a collection. The same remark applies to the works carried out under the supervision of Her Majesty's Office of Works and Mr. Draper.

The Trustees have great pleasure in thus recording the safe reception of the long dispersed and exiled collection of national portraits in the new, and it is to be hoped final home, which has been provided for them by the generosity of the Trustees' valued colleague, Mr. W. H. Alexander.

The removal of the collections has been carried out by the Trustees by special arrangement with the architect and Her Majesty's Office of Works, although the building is at the present date still incomplete in some small details, and has not yet been handed over by the generous donor to Her Majesty's Government.

Under this arrangement the Trustees were enabled to hold their first Board meeting in the new Gallery, the 212th since the foundation of the Gallery, on the 27th June 1895.

The pictures, sculpture, autographs, &c. having been safely bestowed in the new building, the Director at once set to work to classify and arrange them in the galleries in the proper order for placing on the walls. In this work the Director has been guided by a decision of the Trustees that the arrangement should be as far as possible strictly chronological without reference to the artistic merit of the paintings or sculpture.

This decision was made in consequence of their opinion that it is as a historical collection, rather than as a collection of works of art, that the National Portrait Gallery has a claim upon the interests of the public.

The work of re-arrangement is in progress, but will occupy some considerable time to come.

CONDITION OF THE COLLECTION.

Previous to the removal of the collection from Great George Street and Bethnal Green a thorough inspection of the pictures was made by Messrs. Haines, picture restorers to the Gallery, and it was decided that the whole collection of portraits stood in need of a thorough surface-cleaning before they were re-hung on the walls of the new Gallery and submitted again to the inspection of the public. A closer examination showed that although the bulk of the pictures was in very fair order, there were a certain number of pictures which stood in immediate need of further attention and repairs either by relining, removal of the old varnish, parquetting, or similar work. It was decided that as much of this work as possible, if not all, should be completed before the Gallery was re-opened to the public.

The frames of nearly all the pictures which had been in the Bethnal Green Museum or stored in the National Gallery were also found to be in a state of great disfigurement through dirt and age, and to require general cleaning, repairing, and in some cases regilding before they could be hung in the new Gallery. This work has therefore been intrusted to Mr. Draper the Gallery agent.

The sum of 500*l.*, which had been provided in the Estimates for 1895–6, under the sub-head, Incidental Expenses Gallery, to meet these charges, was found quite inadequate for the purpose if the collection was to be put in a proper state of repair and cleanliness before the Gallery was re-opened to the public.

As, however, it had been the practice of the late Director during the 10 years that the bulk of the collection had been removed from his charge to that of the Department of Science and Art to surrender annually to the Treasury the balance of the grant under the aforesaid sub-head, which would ordinarily have been expended in the renovation of the pictures then at Bethnal Green, the Trustees applied for and obtained a supplementary Vote of 750*l.* under this sub-head, this being almost the exact total of the sums surrendered to the Treasury during the past 10 years for the aforesaid reason. The Trustees therefore hope to be able to put the whole collection into a thorough state of repair before the Gallery is opened to the public. The work of cleaning and repairing the frames and pictures is being carried out as rapidly as possible, but it will necessarily be some time yet before the whole work can be satisfactorily completed.

The number of visitors to the Gallery from the commencement in Great George Street, Westminster, to September 1885 (when the collection was removed to Bethnal Green), is shown by the following table :—

Year.	Visitors.	Year.	Visitors.
1859	5,305	1876 (Exhibition of Scientific Instruments, and the Prince of Wales's Indian Presents).	108,252
1860	6,392	1877	79,987
1861	10,907	1878	72,105
1862 (Exhibition year)	17,927	1879 (closed for alterations in the spring months).	64,034
1863	10,475	1880	76,109
1864	14,885	1881	84,532
1865	16,642	1882	84,599
1866	24,666	1883 (International Fisheries Exhibition).	146,187
1867	24,649	1884 (International Health Exhibition).	120,716
1868	25,344	1885 (International Inventions Exhibition). Closed in September for removal.	88,760
1869 (not opened at Christmas)	24,757		
1870 (opened in March at South Kensington).	58,913		
1871	63,195		
1872	67,039		
1873	60,047		
1874	65,201		
1875	71,740		

Grand Total, September 1885, at South Kensington - - - 1,493,365

The following table shows the number of visitors in each month for the last 10 years till the removal from South Kensington :—

Months.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
January	4,948	4,401	4,418	2,880	4,435	4,332	6,006	7,168	6,160	5,824
February	3,687	3,588	3,023	71	3,222	3,135	3,655	4,292	5,054	4,966
March	4,937	4,785	4,753	—	10,784	5,101	4,936	12,068	6,349	6,446
April	14,375	10,430	10,138	—	5,984	10,946	9,725	7,679	13,233	11,061
May	7,280	11,204	4,592	533	10,326	5,558	8,950	19,731	8,280	12,763
June	14,976	5,065	9,419	15,425	5,759	10,537	5,928	11,402	12,973	9,710
July	12,491	8,399	6,341	9,122	6,715	5,521	7,885	14,079	11,832	12,811
August	17,322	9,938	10,316	12,200	10,978	14,957	13,716	26,074	18,405	25,179
September	14,015	7,756	7,075	9,051	5,746	7,934	8,914	15,843	15,125	—
October	5,907	4,888	4,445	5,827	3,936	5,013	5,386	17,616	11,310	—
November	2,512	2,887	2,922	3,382	3,106	4,154	4,384	4,357	4,807	—
December	5,802	6,646	4,663	5,543	5,118	7,344	5,114	5,878	7,188	—
Total	108,252	79,987	72,105	64,034	76,109	84,532	84,599	146,187	120,716	88,760

(1883: International Fisheries Exhibition. 1884: International Health Exhibition. 1885: International Inventions Exhibition.)

Total number of visitors during 10 years - - 925,281

Signed by order of the Board,
LIONEL CUST,
Director, Keeper, and Secretary.

National Portrait Gallery,
St. Martin's Place, W.C.,
12th day of September 1895.

NATIONAL GALLERY, IRELAND.

REPORT

OF

THE DIRECTOR

TO THE

BOARD OF GOVERNORS AND GUARDIANS

OF THE

NATIONAL GALLERY OF IRELAND,

FOR THE YEAR 1894.

Presented to both Houses of Parliament by Command of Her Majesty.

DUBLIN:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY ALEXANDER THOM & CO. (LIMITED).

And to be purchased, either directly or through any Bookseller, from
HODGES, FIGGIS, and Co. (Limited), 104, Grafton-street, Dublin; or
EYRE and SPOTTISWOODE, East Harding-street, Fleet-street, E.C.; or
JOHN MENZIES and Co., 12, Hanover-street, Edinburgh, and 90, West Nile-street, Glasgow.

1895.

[C.—7868.] *Price* 1½*d.*

DIRECTOR'S REPORT FOR 1894.

National Gallery of Ireland,

23*rd May*, 1895.

My Lords and Gentlemen,

I have to submit the following Report for the year 1894.

The National Gallery of Ireland was open to the public under the usual conditions from the 1st January to the 31st December, with the exception of October, during which month it was closed for cleaning, &c.

Within that period the number of visitors was :—

Free admissions,	72,290
(Of whom 21,249 entered on Sundays.)	
By payment,	1,480
Students' attendances,	1,345

The number of Catalogues sold was 397.

The number of new students admitted to copy was 44—37 ladies and 7 gentlemen.

The following pictures were purchased, at the prices appended, and approved by the Board :—

For the general collection :—

	£	*s.*	*d.*
Portrait of an old Lady, ascribed to F. Bol,	100	0	0
Portrait of Fras. Wm. 2nd Earl of Charlemont, by Sir Thomas Lawrence,	50	0	0
Sketch for picture of Greenwich Pensioners, by John Burnett,	24	0	0
Landscape, with cattle, by Jakob Van Strij,	2	10	0
Landscape, by Pieter Van Asch,	5	0	0
The Three Philosophers, *pasticcio* upon Giorgione, by D. Teniers,	20	0	0
Vertumnus and Pomona, by Nicholas Maas,	120	0	0
A Dutch Interior, by Thomas Wijck,	80	0	0
Portrait of a Man, by G. Pencz,	16	16	0
A Hunting Party, by Johannes Lingelbach,	50	0	0
Titania, Puck, and the Changeling, by G. Romney,	215	5	0
Landscape, by Emile Lambinet,	85	0	0
Sketch, Portrait of a Highland Forester, by Charles Grey, R.H.A.,	5	0	0
Early Snow on the Welsh Hills (water colour), by Thomas Collier,	12	10	0
A Pair of Portraits (in pencil), by Thomas Gainsborough,	5	5	0

For the National Portrait and Historical collection :—

	£	*s.*	*d.*
A Pair of Portraits of Mr. and Mrs. Connolly, Artist unknown,	22	0	0
Portrait of George Barret, junior, by Himself,	20	0	0
Portrait of Maria Gunning, Countess of Coventry, by Francis Cotes, R.A.,	250	0	0
View of Thomas-street, Dublin, in 1797 (water colour), by James Malton,	17	10	0
Portrait of Rev. Arthur O'Leary (mezzotint), by G. Keating after J. Murphy,	1	1	0

The following Donations were received during the year :—

The Betrayal of Christ, by Gerard Honthorst. Presented by George Donaldson Esq., London.
View in Namur (water colour), by Jn. S. Cotman. Presented by F. Fleischmann, Esq., London.
Five copies (in water colour), by H. Wheelwright, from early Italian paintings. Bequeathed by Miss Thompson, of 16, Fitzwilliam-place, Dublin.

The following have been kindly lent to the Gallery, for a limited period :—

1. By Colonel Burges, Parkanaur, Co. Tyrone.

A Portrait, by G. Romney.
Three Landscapes, by J. Van Goyen.
Shipping, by H. Dubbels.
A Portrait of a Child, by Eglon Van der Neer.
A Portrait of a Man, by Paulus Moreelse.

2. By J. Jameson, Esq., 5, Upper Merrion-street, Dublin.

Two Portraits, by Sir H. Raeburn.

The "Interior" by Pieter Codde ; the "Shepherds reposing at night," by Rembrandt ; and the "Portrait of a Jew" by Gerbrandt Van den Eeckhout, which had been sent to the Royal Academy of Arts, for exhibition at the "Old Masters," were safely returned, and re-hung in the Gallery.

The "Lucretia" by Francia, was lent to the Exhibition of Works of the School of Ferrara-Bologna, held at the Burlington Fine Arts Club, London, and was safely returned, and replaced in the Gallery.

During the year the following pictures were surface-cleaned and varnished.

No. 117. The Virgin enthroned, by M. Palmezzano.
„ 99. Phineus and his followers, by N. Poussin.
„ 277. St. Jerome, by G. Vasari
„ 96. Landscape, by Salvator Rosa.
„ 94. Timoclea and Alexander, by P. della Vecchia.
„ 89. Christ on the Cross, by A. Carracci.
„ 87. Aeneus and Meleager, by G. Varotari.
„ 46. Theology, by Jakob Jordaens.
„ 57. The Supper at Emmaus, by Jakob Jordaens.
„ 205. The Marriage of Strongbow, by D. Maclise.
„ 240. Pope Pius VII and Napoleon, by Sir D. Wilkie.
„ 111. Adoration of the Shepherds, by Scarsellino.

During the month of October some re-arrangement of the pictures in the Italian and Modern Galleries was made.

Twenty-four of the reproductions of Rembrandt's drawings were framed, and added to those already exhibited on the screen in the Gallery.

In the Historical and Portrait Gallery, besides some re-arrangement of the pictures and drawings, the whole of the mezzotint and engraved portraits have been classified and re-hung, and fifty additional portraits, chiefly from the Chaloner-Smith collection, framed and added to those already in the Gallery. All these have been correctly labelled.

The entire collection of Portraits belonging to the Gallery has been carefully gone over and a complete alphabetical catalogue compiled. This includes not only the exhibited portraits, but also all the engravings which, owing to want of space, cannot at present be hung. Visitors to the Gallery are thus enabled to at once obtain information as to any portrait they may desire to see.

Following the resolution of the Board of Governors and Guardians passed in 1893, in favour of an increase in the wages of the Porters of the Gallery, the Treasury, on 19th September, 1894, consented to an increase as follows:—

J. Dunne,
L. Pedreschi,
M. Forde,
} to receive 24*s.* a week.

D. Cleary to have 23*s.* a week, rising to 24*s.* after 10 years' service.

E. Boyle to have 20*s.*, rising 1*s.* a week, per year, to 24*s.*

This increase was to take effect from the 1st April, 1894, and accordingly the Porters have been in receipt of their increased wages since that date.

On the 30th April Mr. P. W. Kennedy, Registrar of the Gallery, retired on a pension, after a service of 21 years; and the Governors and Guardians, at a meeting held on the 19th April, appointed Mr. W. G. Strickland to be Registrar of the Gallery. This appointment was confirmed by the Treasury, and Mr. Strickland entered upon the duties of his office on the 1st May.

By your instructions I appended to my report for 1893, a paragraph reciting the following resolution adopted by the Board on the 2nd of August, 1894—

> "In adopting the Director's Report for 1893, the Governors and Guardians of the National Gallery, Ireland, again take the opportunity of pressing on Her Majesty's Government the urgent necessity for an extension of the Gallery buildings in accordance with the scheme submitted to the Treasury in November, 1892."

I have now to say that the necessity for an extension becomes more pressing with every month, and that at present communications frequently reach me from donors of valuable works of art complaining of their non-exhibition—which is inevitable—and even demanding their return.

I am,

My Lords and Gentlemen,

Your obedient servant,

WALTER ARMSTRONG,

Director.

APPENDIX.

DESCRIPTIONS OF PICTURES AND DRAWINGS ACQUIRED DURING THE YEAR.

1. Ferdinand Bol, ascribed to (1611-1681). Dutch School.

Portrait of an Old Lady.

An Old Lady seated, three-quarter length, directed to the right, looking to the front. Wears a loose black mantle over a tight-fitting body of red trimmed with gold lace, with large jewel in front, and cut low to show white chemisette and collar. On her head she wears a close-fitting black cap with gold and pearls in front and sides, and lace veil hanging behind. Her left hand rests on her knee, her right hand across the body.

On Panel, 2 feet 4½ inches high, 1 foot 11 inches wide.

Purchased, in London, from Mr. W. Abraham. Hung in the Gallery, in the small Dutch room, and numbered 346.

2. Sir Thomas Lawrence, P.R.A. (1769-1830). British School.

Portrait of Francis William, 2nd Earl of Charlemont.

Half length, directed to the front, looking downwards to the left. Dressed in tight-fitting coat with fur collar.

This portrait is a fragment from a full length group of Lord and Lady Charlemont and their infant son, formerly at Roxborough Castle, Moy, Co. Tyrone, the seat of the Earl of Charlemont.

Canvas, 2 feet 6 inches high, 2 feet wide. Purchased from S. Gooden, London. Hung in modern Gallery, and numbered 379.

3. John Burnet (1784--1868). British School.

Sketch for the picture of "Greenwich Hospital and Naval Heroes," now at Apsley House, London.

Canvas, 1 foot 5½ inches high, 2 feet 5 inches wide. Purchased from Shepherd Brothers, London. Hung in modern Gallery, and numbered 378.

4. Jakob Van Strij (1756--1815). Dutch School.

A Landscape; in foreground stands a black cow; behind are two others, a dun and a red, lying down.

On Panel, 2 feet 4½ inches high, 1 foot 11 inches wide. Purchased from Mrs. Algie, Dublin. Hung in small Dutch Gallery, and numbered 344.

5. Pieter Jansz Van Asch (1603--1678). Dutch School.

Landscape; on the left is a building on a high rock overlooking a river spanned by a bridge. A road over the latter leads past a thick wood on the right; on it are two figures on horseback, a man walking, and a woman, with a basket, seated.

Octagonal Panel, 1 foot 4½ inches high, 1 foot 9 inches wide. Signed with initials.

Purchased from Mrs. Algie, Dublin. Hung in Main Gallery, and numbered 343.

6. David Teniers (1610-1694). Dutch School.

Three figures in a landscape, Pasticcio upon Giorgione's "Three Philosophers" at Vienna. In foreground of trees and rocks are three figures, two standing and one seated, which originally represented the three Philosophers, or Magi, but here altered by Teniers to Beggars. In the background are mountains and a town.

On Panel, 8¼ inches high, 1 foot wide. Formerly in the Blenheim Palace collection; purchased from Mr. Donaldson, London. Hung in Main Gallery, and numbered 390.

7 Nicholas Maas (1632-1693). Dutch School.

Vertumnus and Pomona.

Vertumnus in the guise of an old woman is exerting her persuasive powers upon Pomona, a young girl, who listens attentively. Both seated on a stone bench with balustrade behind. Vertumnus is dressed in black and brown, with white mob cap; Pomona, all in bright vermilion, with white under dress showing at shoulders and arms. A black and gold girdle, with tasselled ends, round her waist, from which hangs also a bunch of keys and a large étui. On her head she wears a wide-leaved straw hat. In foreground, at her feet, a large basket of fruit.

On Panel, 1 foot 6 inches high, 2 feet wide; signed and dated, on end of the bench, "N. Maas 1673."

Purchased in Paris from Mons. S. Bourgeois. Hung in small Dutch Gallery, and numbered 347.

8. Thomas Wijck (*d.* 1677). Dutch School.

Interior of a weaver's cottage. A room, with a weaver on the right working at his loom, and apparently conversing with his wife, who is to the left of the picture. Near her are two children, one of whom sits in an enclosed box-chair. Scattered about are various utensils,—a barrel, buckets, &c. Two small windows of leaded glass admit the light.

On Panel, 1 foot 3½ inches high, 1 foot 2 inches wide.

Purchased in Paris from Mons. S. Bourgeois. Hung in small Dutch Gallery, and numbered 349.

9. Georg Pencz (*d.* 1550). German School.

Portrait of a young man, half length, to left; wearing a black doublet with short full sleeves, below which appear tight-fitting sleeves of brown; small frill or ruff round the neck; and on his head a flat black cap or bonnet. In his left hand he holds a skull.

Panel, 1 foot 4¼ inches high, 11 inches wide. Inscribed on left upper corner, "Ætatis suæ, XXV, Anno 1547," and the initials. in monogram, G.P.

Purchased at Christie's. Hung in South Gallery, and numbered 372.

10. Johannes Lingelbach (1625–1687). Dutch School.

Landscape. In the foreground are two huntsmen and a lady on horseback—the latter on a white horse—before an inn from which a man is bringing refreshment. Three other figures are seated or standing before the doorway, and on the right is an attendant with dogs. In the distant back-ground are others of the party with dogs and hawks.

Panel, 1 foot two inches high, 1 foot 4½ inches wide. Signed on ground at bottom of panel, "J. lingelbach."

Purchased in London from Mr. S. Gooden. Hung in small Dutch Gallery, and numbered 348.

11. George Romney (1734–1802). British School.

Titania, Puck, and the Changeling. On left, Titania, nude to the waist, with red robe, and a white ribbon in her hair, reclines on the ground, her head supported on her hands. On the right is Puck playing with the Changeling, a nude infant rolling on his back on the ground.

Canvas, 3 feet 5 inches high, by 4 feet 5 inches wide.

Engraved in 1810, by E. Scriven.

Purchased at Miss Romney's sale at Christie's. Hung in Modern Gallery, and numbered 381.

12. Emile Lambinet (1815–1877). French School.

Landscape. In foreground a green field, in which are cattle, slopes down to the edge of a stream or pond. In the back-ground, standing against the sky, a large tree with two smaller ones; a farmhouse behind.

Canvas, 2 feet 11 inches high, 2 feet 3½ inches wide. Signed in right hand bottom corner, "Emile Lambinet," and in opposite corner, "Juillet 1851."

Purchased in London, from Mr. J. M'Lean. Hung in Modern Gallery, and numbered 424.

13. Charles Grey, R.H.A. (About 1808–1892). British School.

Sketch portrait of a Highland Forester. Donald M'Lea, head forester to the Duke of Sutherland. Sketched in 1859 at Rhidorroch, Rossshire—a study for finished picture in possession of Lord Powerscourt.

Half length; an old man wrapped in a plaid, holding a stick in right hand, and telescope under left arm.

Mill-board, 8 inches high, 6 inches wide. Signed, "C. Grey, R.H.A.," and dated 1859.

Purchased from the artist's son. Hung in Modern Gallery, and numbered 426.

14. Thomas Collier (1841-1891). British School.

Early Snow on the Welsh hills. Bleak moorland, with bare hills lightly covered with snow, against a back-ground of lowering leaden clouds.

Water colour. 11 inches high, 1 foot 6½ inches wide. Purchased in London from Mr. S. Gooden.

15. Thomas Gainsborough (1727-1788). British School.

A Pair of Portraits—a man and a woman—in pencil; each on card-board; oval; 5 inches high, 4 inches wide. Signed, in pencil, "Tho. Gainsborough fecit, 1743-4."

Purchased from Mrs. Snow, of Waterford.

16. Painter unknown.

A Pair of Portraits; Mr. Connolly, of Castletown, and his wife.

Mr. Connolly—shown to knees; dressed in long-skirted blue coat, faced and trimmed with gold embroidery or lace. Holds his hat under his right arm. Landscape background.

Mrs. Connolly—three-quarter length. Right hand points to right, while with the left she holds up a loose, floating blue scarf. Dressed in amber satin dress, cut low. Landscape, with waterfall, in back-ground.

Both on canvas; 4 feet high, 3 feet 2 inches wide.

Purchased from Mrs. Gage. Hung in Portrait Gallery, and numbered 421 and 422.

17. George Barret, junr. (about 1774-1842). British School.

Portrait of the Artist. Three-quarter length; seated to the left before an easel, on which is a painting of a landscape; looking to the front. Dressed in a green coat, with high collar of yellow waistcoat showing. Holds a brush and mahlstick in his hands.

Panel, 2 feet 6 inches high, 2 feet wide.

Purchased from Mr. John Ward, Blackburn, Lancashire. Hung in Portrait Gallery, and numbered 415.

18. Francis Cotes, R.A. (1726-1770). British School.

Portrait of Maria Gunning, Countess of Coventry.

To waist, turned to right, facing to front. Low cut grey satin, or silk, dress, with two rows of pink rosettes down the front and on shoulders, and slashed sleeves; loose blue scarf. Hair, black and curled at back, with string of pearls.

Canvas, oval, 2 feet 6 inches high, 2 feet 1 inch wide.

Painted in 1751, and engraved in mezzotint by J. MacArdell. Formerly in possession of the Rev. Gilbert George Coventry. Purchased from Messrs. Lawrie & Co., London.

Hung in Portrait Gallery, and numbered 417.

19. James Malton (d. 1803). British School.

View of Thomas-street, Dublin, in 1797. St. Catherine's Church, and figures, in the foreground. The latter differ from those in the engraving of this view published the same year.

Water colour, 1 foot 9 inches high, 2 feet 6 inches wide. Purchased from Messrs. Durlacher, London. Hung in Portrait Gallery.

20. Gerard Van Honthorst (1590–1656). Dutch School.

The Betrayal of Christ. Christ seized by the soldiers and servants of the High Priest. A young man stands prominently in the foreground with right hand clenched, and seemingly uttering threats or imprecations. He wears a steel corslet over a bright brown, or yellow garment; loose red breeches, and a flat black cap with ostrich feather. On right is boy holding a torch which lights the scene. Peter, on the left, stands with uplifted sword over the High Priest's servant who has fallen to the ground, and whose lantern lies near him. In the background, with other figures, Judas appears, holding a bag of money.

Canvas, 6 feet 7 inches high, 9 feet 2 inches wide.

Presented by George Donaldson, Esq., London, to the Gallery, in memory of his mother, a native of Dublin.

Hung in South Gallery, and numbered 425.

21. John Sell Cotman (1782–1842). British School.

A view in Namur.

Water colour, $10\frac{1}{4}$ inches high, 1 foot $3\frac{1}{2}$ inches wide.

Presented by F. Fleischmann, Esq.

22. H. Wheelwright.

Five copies, in water colours, after early Italian paintings, viz. :—

1. Pieta by Giottino, in the Uffizi Gallery, Florence.
2. St. Stephen preaching. Fresco by Fra Angelico in the Vatican Chapel of Nicholas V.
3. A woman with a child in her arms, from the same fresco.

4 and 5. Two small pictures by Giotto in Academia, Florence.

Bequeathed by Miss Thompson, of 16, Fitzwilliam-place, Dublin.

Printed for Her Majesty's Stationery Office,
By ALEX. THOM & CO. (Limited), 87, 88, & 89, Abbey-street, Dublin,
The Queen's Printing Office.

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending 31st of March 1894.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

And to be purchased, either directly or through any Bookseller, from
EYRE AND SPOTTISWOODE, East Harding Street, Fleet Street, E.C.; or
32, Abingdon Street, Westminster, S.W.; or
JOHN MENZIES & Co., 12, Hanover Street, Edinburgh; and
90, West Nile Street, Glasgow; or
HODGES, FIGGIS, & Co., Limited, 104, Grafton Street Dublin.

1894.

[C.—7614.]

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THE METEOROLOGICAL COUNCIL,

1893–94.

Lieutenant-General Richard Strachey, R.E., C.S.I., LL.D., F.R.S., Chairman.

Mr. Alexander Buchan, M.A., LL.D., F.R.S.E.

Professor George Howard Darwin, M.A., LL.D., F.R.S.

Mr. Francis Galton, M.A., D.C.L., F.R.S.

Mr. Edward J. Stone, M.A., F.R.S.

Captain William J. L. Wharton, R.N., F.R.S., Hydrographer of the Admiralty.

REPORT

OF THE

METEOROLOGICAL COUNCIL

TO THE

ROYAL SOCIETY,

For the Year ending March 31, 1894.

Introductory.

THERE has been no change in the Council during the year. The executive officers are, as stated in the last Report :—

Mr. R. H. Scott, M.A., F.R.S., Secretary.
Nav.-Lieut. C. W. Baillie, R.N., F.R.A.S., Marine Superintendent.

The Report is, as usual, divided into four sections or parts:

I. OCEAN METEOROLOGY.
II. WEATHER TELEGRAPHY.
III. LAND METEOROLOGY.
IV. MISCELLANEOUS.

PART I.

OCEAN METEOROLOGY.

Collection of information.

Collection of Information.—The practice followed by the Office in the collection of information has been to supply observers with a complete outfit of verified instruments, on the condition of their returning the instruments, and the log of observations made with them, to the Office at the completion of the voyage.

The instruments supplied are:—
One barometer; six thermometers, with a screen; four hydrometers.

The first record of observations is made in a rough book supplied for the purpose, which is retained by the Captain, who copies the observations into a regular form of log kept for the Office. As regards the Royal Navy, Her Majesty's ships are supplied by the Office with the meteorological instruments used in the Service, and the Council are glad to say that they receive from time to time meteorological logs of high value from this source.

In order to facilitate the communications between the Office and the observers, agencies are established at some of the principal ports, and instruments are supplied direct from them to the ships.

Collection of information.

The following is a list of the agents at present in connexion with the Office :—

Aberdeen, J. R. Jones, Navigation School.
Cardiff, T. S. Ainsley, Bute Docks.
Dundee, Capt. A. Wood, Navigation School.
Glasgow, Messrs. D. McGregor and Co., Clyde Place.
Greenock, Messrs. D. McGregor and Co., Brymner Street.
Hull, Z. Scaping, Trinity House.
Liverpool, J. Gill, Nautical College.
Southampton, Capt. D. Forbes, High Street.

Occasionally captains are supplied at ports where there are no agencies, and in these cases the instruments are sent direct from the Office in London.

A set of instruments is kept in working order at the Office in London, and at each agency, for the purpose of instructing observers in the handling and reading of all the instruments. A notice to captains is frequently distributed to vessels lying in the various London docks, and copies of it are also supplied to each agent for circulation.

Various publications (see pp. 94–99) are presented by the Council to observers who supply the Meteorological Office with thoroughly well kept logs, in recognition of their co-operation in a work which is calculated to be of very great advantage to navigators and to science generally.

Recognition of "excellent" observers.

Appendix I. (p. 23) contains a list of all the observers who during the past year have contributed logs classed as "excellent." Several of these observers have regularly co-operated with the Office for many years. The names which appear in the list for the first time are as follow :—

Observer's Name.	Ship.
Alford, F.	S.S. "Monarch."
Campbell, J. J. W. (Surgeon)	S.S. "Diana."
Chesshire, G. H.	S.S. "Aldgate."
Cust, H. E. P., R.N.	H.M.S. "Dart."
Davidson, D. C.	"Loch Rannoch."
Davidson, R.	S.S. "Diana."
Davis, G. W.	S.S. "Alberta."
Elliott, C.	S.S. "Wilcannia."
Fraser, C.	S.S. "Massilia."
Lewes, P. V., R.N.	H.M.S. "Blanche."
Lindley, G. R., R.N.	H.M.S. "Blanche."
McKinstry, E. R., R.N.R.	S.S. "Germanic."
Marescaux, A. E. H., R.N.	H.M.S. "Dart."
Margesson, W. H. D., R.N.	H.M.S. "Egeria."
Murray, R. G., R.N.R.	S.S. "Britannia."
Nicol, R.	S.S. "Germanic."
Pentin, W.	S.S. "Wilcannia."
Philip, W., Junr.	"Salamis."
Robertson, T.	S.S. "Active."
Smith, J.	S.S. "Dunera."

Characters of logs received.

The total number of Meteorological logs received in the year ending March 31, 1894, was 151, of which 139, or 87 per cent., have been classed as either "excellent" or "very good."

The Council have also received, through the Ocean Steamship Company of Liverpool, a considerable number of ships logs, mostly from voyages to and from the China Seas, viâ Suez.

The Council take this opportunity of expressing their best thanks to the observers who have assisted them during the past year.

They regret to have to announce the deaths of two of their observers; Captain John Gray, who had supplied most valuable information in the logs of his numerous whaling and sealing voyages, and Captain J. E. Thompson of the "Monarch," H.M. Cable Ship.

Appendix II. (p. 25) gives a list of the meteorological logs and of meteorological reports from stations abroad, received at the Office during the year.

Districts from which observations are obtained.

The following summary of the voyages of the ships observing for the Office shows the districts from which observations were received during the year:—

To Baffin's Bay or Greenland	3
„ North America, East Coast	16
„ „ „ West „	9
Off East Coast of North America	3
To West Indies	5
„ South America, East Coast	11
„ „ „ West „	5
„ Australia and New Zealand, viâ Cape of Good Hope	32
„ „ „ viâ Suez	9
At Australian stations	2
To India, viâ Suez	12
„ India, viâ Cape of Good Hope	14
„ China, viâ Suez	5
In China Seas	2
To Cape of Good Hope and East Coast of Africa	7
Off East Coast of Africa	3
To Antarctic Seas	4
To Mediterranean Ports	3
Between British Ports	4
To Continental Ports	2

Red Sea Charts.—These charts have now been all completed, and the work will be issued in the course of the year.

Current charts for all oceans.

Current Charts for all Oceans.—In the Council's Report for the year 1892 it was stated that a considerable amount of information, some 25,000 observations in all, had been obtained from foreign authorities in order to supplement the records of currents derived from English sources of information. During the year now under review a further instalment of some 2,000 observations for the Pacific Ocean has been obtained from Germany, exhausting their data, and the Council are of opinion that they have now procured nearly all the trustworthy current observations in existence, at least in the archives of the various meteorological

Current charts.

bureaus in Europe. The somewhat difficult task of preparing the data thus collected for publication is now being undertaken, for which purpose generalised results, indicating the most probable set of the currents, have to be obtained from a multitude of separate and often divergent observations, an operation requiring the exercise of much care and judgment.

The Meteorology of the South Sea.—This investigation has made steady progress during the year, but none of the final charts have as yet been placed in the engraver's hands.

The South Atlantic and West Coast of South America.—The preparation of logs and extraction of data for this district, extending from 10° E. to 100° W. Longitude, is being actively prosecuted. In the South Sea, the southern limit of the area to be discussed is given by the northern limit of the South Polar Ice.

Stock of instruments belonging to the Office.

Supply and Stock of Instruments.—In Appendix III. (p. 31) is given a list of the meteorological instruments supplied by the Office to ships in the Royal Navy during the year, with a statement for the 31st March 1894 of the stock and distribution of the instruments standing on the books to the account of the Admiralty. The recent augmentation of the number of ships in commission and in reserve has led to the necessity of providing a considerably larger stock of instruments than had been required in former years.

Appendix IV. (p. 32) gives similar information with regard to the disposal of the other instruments belonging to the Office, remaining in store, or which have been supplied to the Mercantile Marine, and to observatories, telegraph stations, &c.

PART II.

Weather Telegraphy and Forecasts.

Administrative.

There have been no serious interruptions of telegraphic communication during the year, excepting that the cable to Jersey broke down in January, and communication was not restored for a fortnight.

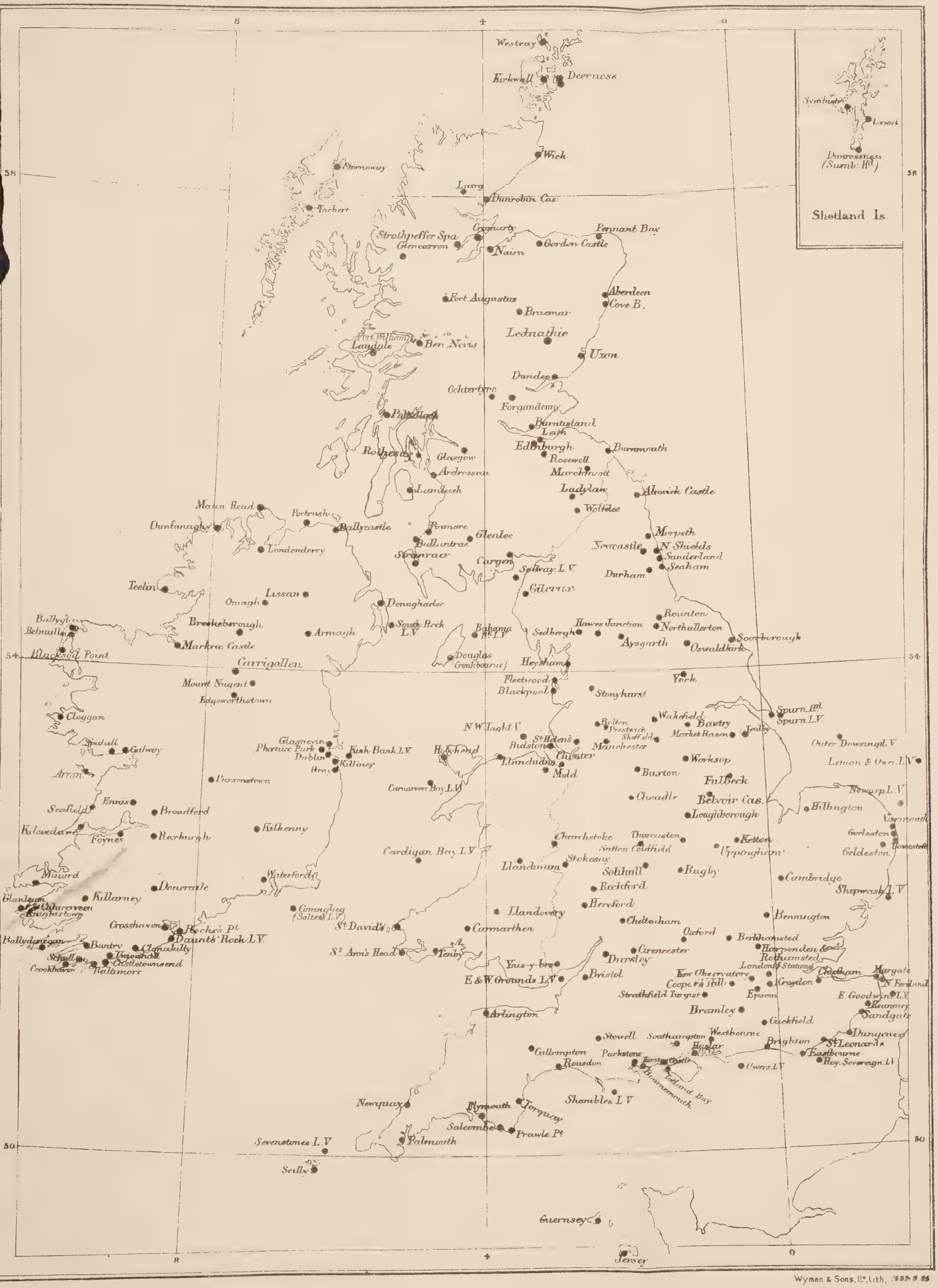
Among the observers the changes have been numerous. At Holyhead Mr. T. Chope has succeeded Captain S. Richards, at Hurst Castle Mr. E. T. Tremble has succeeded Mr. G. G. Appleton, at Parsonstown Mr. J. Perry has succeeded his brother Mr. W. J. Perry, at Pembroke Mr. S. Blake has been succeeded by Mr. Knott, and at Prawle Point Mr. W. Hewitt by Mr. Michael Holmes.

Daily and Weekly Weather Reports.

A list of the British telegraphic reporting stations is given in Appendix XI. (p. 64), and Foreign stations in Appendix XI. (p. 68).

An important addition has been made during the year to the information received from foreign stations, the Portuguese Meteorological Office having commenced the daily transmission of reports from two stations in the Azores.

MAP SHOWING THE APPROXIMATE POSITIONS OF THE STATIONS FROM WHICH OBSERVATIONS ARE RECEIVED.



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For details of Information Received.—See Appendix XI.

The work in this branch of the Office continues to increase. The Daily and Weekly Weather Reports, in particular, have been extended and improved.

Inspection of the Stations.

Inspection of the Telegraphic Reporting Stations.—The telegraphic reporting stations have been inspected during the year, in England by Mr. Ley, in Scotland by Mr. Buchan, and in Ireland and Wales by Mr. Scott. The reports submitted by the Inspectors to the Council, which are printed in Appendix V. (p. 33), show that the efficiency of the service continues to be satisfactorily maintained.

Discussion of the reports.

Discussion and Publication of the Information received.—The practice of the Office in collecting, discussing, and disseminating the meteorological information received by telegraph is described in Appendix X. of the Report for 1891. The Daily Weather Report has appeared regularly during the year; for details see that Appendix. It is distributed free of cost as follows:—To newspapers, seven copies; to seaports, for public exhibition, 71 copies; to Government offices and public institutions, 79 copies; to correspondents of the Office, 61 copies; and to foreign meteorological establishments, 35 copies. Nearly 200 copies are issued regularly to subscribers.

Distribution of reports.

The Weekly Weather Report, with its Monthly Appendices, has also appeared regularly; for particulars of this publication see Appendix VI. (p. 52).

Display of information in front of the Office.

Public display at the Meteorological Office in London of the State of the Weather on British Coasts.—This arrangement, which was made with a view to the earliest possible supply to the public of the latest information as to the weather received from the principal points on the eastern, southern, and western coasts, has been regularly carried out, and it is believed with general public approval. It supplies at 9.30 a.m. and 3 p.m. every week day the substance of the reports received by telegraph, of the state of the weather and sea at the following stations: Yarmouth, Dungeness, the Needles (Hurst Castle), Scilly, Holyhead, and Valencia, and this is displayed in a conspicuous manner on the front of the Office, 63, Victoria Street, S.W.

Forecasts for the Fleet.

Supply of Forecasts to the Fleet.—At the request of the Admiralty daily forecasts were supplied to the Commander-in-Chief of the "A" Fleet during the continuance of the Manœuvres, as in previous years, and also to the Commander-in-Chief, Devonport. This latter service is continued throughout the year. It commenced at the end of 1890.

Forecasts.

Weather Forecasts.—Forecasts are prepared three times a day, namely, at 11 a.m., at 3.30 p.m., and 8.30 p.m. The Forecasts prepared at 11 a.m., on the information derived from the 8 a.m. reports, refer to the probable weather between noon on the day of issue and noon on the following day. They are publicly

exhibited in several places in London,* and are supplied to the afternoon editions of the newspapers. The 3.30 p.m. Forecasts are employed for storm warnings only, excepting in the hay harvest season, when they are issued as subsequently explained. The forecasts at 8.30 p.m. are specially prepared for publication in the morning newspapers, but all the forecasts are available for the information of anyone who applies for them at the Office.

Inquiries at the Office.

The inquiries received through the Post Office for special forecasts during the year amounted to 75, and the personal applications to 74. The rules of the Office relating to such inquiries are stated in Appendix VI., p. 55.

Results of Forecasts.

The results of a comparison of the Forecasts issued at 8.30 p.m. during the year, with the weather actually experienced, are given in Appendix VII. (p. 56). The following summary shows the successes and failures over the whole United Kingdom, estimated as explained in that Appendix.

SUMMARY of RESULTS of 8.30 p.m. FORECASTS, 1893–94.

Districts.	Per-centages.				Total per-centage of Success.
	Complete Success.	Partial* Success.	Partial* Failure.	Total Failure.	
SCOTLAND, N. - -	59	26	10	5	85
„ E. - -	57	27	10	6	84
ENGLAND, N.E. - -	59	26	12	3	85
„ E. - -	61	26	10	3	87
MIDLAND COUNTIES -	60	24	12	4	84
ENGLAND, S. - -	65	24	9	2	89
SCOTLAND, W. - -	57	23	13	7	80
ENGLAND, N.W. -	59	24	11	6	83
„ S.W. -	60	23	11	6	83
IRELAND, N. - -	57	26	9	8	83
„ S. - -	55	27	10	8	82
Summary - -	59	25	11	5	84

* Note "partial" implies "more than half."

Testing of Forecasts.

The following table shows for each year from 1884 to 1893, inclusive, the per-centages of complete and partial success of the Forecasts issued at 8.30 p.m. for the whole year. It will be seen that the total for "complete success" was highest in 1893.

* Viz., in the City at the Mansion House, Lloyd's Rooms, Messrs. R. & J. Beck's Cornhill, and Messrs. de la Rue & Co.'s, Bunhill Row; in the West End, in the Libraries of the House of Lords and the House of Commons, at Messrs. Elliot's, St. Martin's Lane; Messrs. Stanford's, Charing Cross; Messrs. Negretti & Zambra's, Regent Street; and Messrs. Pastorelli's, New Bond Street; and at the Office, 63, Victoria Street.

PER-CENTAGES of RESULTS of FORECASTS for the whole of the BRITISH ISLES.

Year.	Complete Success.	Partial, *i.e.*, more than Half Success.	Total Success.
1884 - -	50	31	81
1885 - -	50	34	84
1886 - -	49	31	80
1887 - -	52	32	84
1888 - -	51	31	82
1889 - -	49	32	81
1890 - -	50	32	82
1891 - -	50	30	80
1892 - -	46	33	79
1893 - -	59	25	84
Average - -	51	31	82

Hay Harvest Forecasts.—The Council renewed in 1893 the offer made in previous years to the Royal Agricultural Society, the Royal Dublin Society, and the Highland and Agricultural Society to send Daily Forecasts *gratis* during the haymaking season to a number of observers selected by those Societies, on two conditions, viz., that the information should be made known as widely as possible, and a record of the weather actually experienced sent weekly to the Office. The Societies accepted the proposal, and the Forecasts were issued as shown in the following table:— Hay Harvest Forecasts.

LIST of those who received HAY HARVEST FORECASTS in 1893.

Districts.	To whom sent.	Address.
0. SCOTLAND, N.	Rev. Dr. Joass	Golspie.
	Major Smith	Munlochy, Inverness.
1. SCOTLAND, E.	T. Wilson	Glamis Castle, by Forfar.
	C. Pirrie	Rothiemay, Huntly.
	T. Bett	Dalnaline, Aberfeldy.
2. ENGLAND, N.E.	Sir J. Wilson	Chillingham Barns, Chatton, Northumberland.
	J. Turner	The Grange, Ulceby.
3. ENGLAND, E.	W. Birkbeck	High House, Thorpe, Norwich.
	Sir J. B. Lawes, Bt., and Sir J. H. Gilbert, Ph.D.	Rothamsted, Harpenden.
4. MIDLAND COUNTIES	Royal Agricultural College.	Cirencester.
	Major Fosbery	Warwick.
	T. H. Thursfield	Barrow, Broseley, Salop.
	E. E. Harcourt-Vernon	Grove Hall, East Retford.
5. ENGLAND, S.	C. Whitehead	Barming House, Maidstone.
	E. P. Squarey	The Moot, Downton, Wilts.
	M. J. Sutton	Kidmore Grange, Caversham.
6. SCOTLAND, W.	W. Calder	Castle Hill, Dalreoch, Dumbarton.
	Sir M. J. Stewart, Bt., M.P.	Ardwell, Stranraer.
	J. S. R. Ballingal	Eallabus House, Islay.
7. ENGLAND, N.W.	G. W. Wray	Leyburn, Yorkshire.

Hay Harvest Forecasts.

Districts.	To whom sent.	Address.
8. England, S.W.	The Earl of Ducie	Tortworth, Gloucestershire.
	T. Dyke	Long Ashton, Clifton, Bristol.
	R. Neville Grenville	Butleigh Court, Glastonbury.
9. Ireland, N.	E. F. Farrell	Moynalty, Co. Meath.
	J. M. Wilson, J.P.	Currygrane, Edgeworthstown.
10. Ireland, S.	D. A. Milward	Lavistown, Kilkenny.
	W. Talbot Crosbie, D.L.	Ardfert Abbey, Tralee, Co. Kerry.

In addition to the above names the forecasts were sent to six other gentlemen at their own cost.

The issue commenced over the Southern districts of England on the 13th June, and ended 16th July; but commenced and ended about a fortnight later in the more Western and Northern parts of the country.

The general result of the issue of these forecasts, shown by the subjoined table, has been prepared solely from the reports of the above-mentioned gentlemen, and is entirely independent of any estimate formed within the Office itself:—

Summary of Results.—Hay Harvest Forecasts, 1893.

Districts.	Names of Stations.	Per-centages.				Total per-centage of Success.
		Complete Success.	Partial Success.	Partial Failure.	Total Failure.	
Scotland, N.	Munlochy and Golspie	61	32	7	—	93
„ E.	Aberfeldy, Glamis, and Rothiemay	58	37	4	1	95
England, N.E.	Chatton and Ulceby	68	22	10	—	90
„ E.	Rothamsted and Thorpe	90	7	3	—	97
Midland Counties	Cirencester, East Retford, Warwick, and Broseley.	66	26	6	2	92
England, S.	Caversham, Maidstone, and Downton	72	23	5	—	95
Scotland, W.	Stranraer, Islay, and Dumbarton	59	31	8	2	90
England, N.W.	Leyburn	57	27	13	3	84
„ S.W.	Tortworth, Clifton, and Glastonbury	62	30	8	—	92
Ireland, N.	Moynalty and Edgeworthstown	49	38	8	5	87
„ S.	Tralee and Kilkenny	62	25	11	2	87
	Mean for all districts	64	27	8	1	91

These figures show that the results for the forecasts for 1893 reached a total per-centage of success of 91, being the highest yet recorded.

Forecasts to H.M. Board of Agriculture.—As stated in previous reports, the Council had been in communication with the Board of Agriculture on the subject of giving greater publicity during the harvest season to the weather forecasts prepared in the Meteorological Office, and at the beginning of August a letter was received from the Board, requesting that the afternoon forecasts,

the same as those supplied for hay harvest purposes, should be sent to them daily for transmission to selected stations in Essex and Northumberland. This service was at once commenced and continued for two months. The following report has been received by the Council as to the results of this experiment :— Forecasts to Board of Agriculture.

Board of Agriculture,
4, Whitehall Place, London, S.W.,
April 21, 1894.

SIR,

I AM directed by the Board of Agriculture to transmit a memorandum on the subject of the experimental issue of weather forecasts in the course of last autumn.

I am, &c.
(Signed) RICHARD DAWSON,
Assistant Secretary.

Robert H. Scott, Esq., Secretary,
Meteorological Office,
63, Victoria Street, S.W.,

WEATHER FORECASTS during HARVEST, 1893.

The Board of Agriculture, with a view to test the value of the weather forecasts issued by the Meteorological Council, and the disposition of Agriculturists to make use of these warnings during harvest, arranged for an experimental transmission of the forecasts issued every afternoon during the months of August and September 1893. These were sent by telegraph to nearly two hundred selected telegraph offices in the rural districts of the counties of Essex and Northumberland.

The Post Office Authorities undertook to facilitate the despatch of these messages, the local postmaster being instructed to have them posted up in a conspicuous position in the window of the post office immediately on arrival. The time of receipt was about 4.30 p.m. daily, and such reports as have been received by the Board of Agriculture from the districts to which messages were sent, dispose them to believe that considerable reference in arranging their next day's work was made to the forecasts thus exhibited by farmers resident within short distances of the several offices, and by others who, by means of messengers, were in communication with the towns and villages.

Specific observations made daily at Morpeth in Northumberland were very favourable to the approximate accuracy of the forecasts, the direction of the wind being the item in which the warnings were occasionally in error. In the Allendale district of the same county a material saving of money by the economising of labour, by pre-arrangements made on reliance in the forecasts, was reported by one of the vice-presidents of the Newcastle Farmers Club.

The comparative steadiness of the weather conditions during the harvest months of last year, however, prevented a thorough test of the use of these weather warnings in furnishing reliable advice to agriculturists as to the meteorological conditions to be expected in the twenty-four hours covered by the forecasts, and the applicability of the system at different seasons and to more varied districts has yet to be determined.

Forecasts to Board of Agriculture.

With this view the Board of Agriculture have applied for the sanction of Her Majesty's Treasury to the repetition of the experiment in 1894 over a wider area and under weather conditions likely to be less uniform, selecting three eastern and three western counties, and varying the period for supplying the forecasts so as to cover the time of hay harvest in some cases, and that of grain harvest in others.

Storm Warnings.

Storm Warnings for the Coasts of the United Kingdom.—In Appendix VIII., p. 57, are given the names of the stations furnished with signals for Storm Warnings, in accordance with Circular 717 of the Board of Trade, issued in February 1874.

These stations were, at the end of March 1894, 175 in number, situated :—

85 in England, 16 in Wales, 47 in Scotland, 21 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands.

A comparison has been made in the Office between the warnings issued during the year and the weather experienced on our coasts, the warnings being tested by the method explained in Appendix VI., p. 55. The results of this comparison are shown in the following tables :—

RETURN of the RESULT of the COMPARISON between the WARNINGS ISSUED and the WEATHER EXPERIENCED in 1893.

Coasts.	Total No. of Orders to hoist and repetitions.	Warnings justified by subsequent Gales. Force 8 and upwards.	Warnings justified by subsequent strong Winds. Forces 6 and 7.	Warnings not justified by subsequent Weather.	Warnings late. Force 9 reached at two Stations before issue.	Warnings partially late. Force 9 reached at one Station before issue.	Warnings issued unnecessarily owing to Telegraphic Errors.	Storms for which no Warning was issued.
Scotland, N.E. -	43	33	6	2	—	2	—	Feb. 14, March 15, Sept. 21.
„ E. -	29	12	12	5	—	—	—	Aug. 21.
„ N.W. -	42	27	10	2	1	2	—	March 15, Oct. 25, Dec. 8.
„ W. -	38	21	14	3	—	—	—	
Ireland, S.W. -	41	22	12	5	1	1	—	Aug. 21, Oct. 25.
„ N.W. -	43	26	13	2	1	1	—	March 15, Oct. 25, Dec. 20–21.
Irish Sea - -	37	36	1	—	—	—	—	Feb. 26, March 15, Aug. 21, Oct. 25, Dec. 20–21.
St. George's Channel	32	14	12	4	—	1	1	
Bristol Channel -	35	22	10	1	—	1	1	Dec. 20–21.
England, S.W. -	35	22	8	4	—	—	1	Dec. 20–21.
„ S. -	28	17	10	—	—	1	—	Feb. 26.
„ S.E. -	29	13	14	2	—	—	—	Feb. 26.
„ E. -	25	14	8	3	—	—	—	
„ N.E. -	23	13	7	1	—	2	—	Oct. 25, Dec. 15–16.
Totals - -	480	292	137	34	3	11	3	
Per-centages -		60·8	28·6	7·1	0·6	2·3	0·6	

NOTES as to GALES EXPERIENCED but for which no WARNING was issued.

Storm Warnings.

February 14*th*.—A strong South-Easterly gale over the N.E. of Scotland. Our W. and N.W. coasts had been warned, but on the night of February 13th–14th a new depression—both larger and deeper than the one which preceded it—advanced more rapidly than was anticipated, and unexpectedly caused South-Easterly gales in Scotland. On the morning of the 14th it was too late to remedy the defect.

February 26*th*.—A Southerly gale over the S. and E. of England, and a North-Westerly gale in the Irish Sea.

Force 8 was *exceeded* at a few stations only; the wind blowing as a gale in zones or bands. The appearance of the map for 6 p.m. on 25th was not at all threatening—the wind was, in fact, then decreasing in force.

March 15*th*.—A Westerly gale over Scotland, the N.W. of Ireland, and the Irish Sea.

The 6 p.m. chart of March 14th showed a depression advancing towards Norway from the Westward, which did not appear dangerous, but its intensity increased later. At 8 a.m. on 15th it was altogether too late to do anything.

August 21*st*.—A South-Westerly gale in Ireland and some parts of Scotland. There was evidently a depression approaching Ireland at 6 p.m. on 20th, but the Irish reports were so faulty that we could make nothing of them. The actual changes were also very complex.

October 25*th*.—A Westerly gale over the Irish Sea and N.E. of England. A large, but not deep, depression lay over the northern parts of our area on the 24th, and was moving eastwards. A "V" shaped depression subsequently appeared in the west. It is remarkable that the observations we received by wire showed no general gale nor anything of a really stormy character in the conditions.

December 8*th*, Scotland N.W.—A South-Westerly gale.

There is no indication in the map for 6 p.m., 7th, that the depression which caused this gale (over one district only) was approaching.

December 20*th*–21*st*.—A South-Westerly gale over the N. of Ireland, Irish Sea, and Bristol Channel.

This was caused by a deep secondary depression, of which the reports for the 19th gave no indication.

On September 21*st and December* 15*th to* 16*th*.—Gales were felt on our N.E. coasts. In these cases warnings had been duly sent to adjacent coasts, but the gale spread further than was anticipated.

Comparison of results for 1893 with previous years.

The following table contains a comparative statement of the storm warnings and their results in 1893, and in the nine preceding years. It will be seen that the total per-centage of warnings justified was nearly the same as in 1892.

Years.	Total No. of Warnings issued.	Warnings justified by subsequent Gales.	Warnings justified by subsequent strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.
		p.c.	p.c.	p.c.	p.c.
1884	461	66·4	20·0	86·4	12·1
1885	591	55·3	24·0	79·3	19·5
1886	542	55·3	26·9	82·2	15·9
1887	472	55·5	26·1	81·6	16·4
1888	539	55·3	28·6	83·9	14·3
1889	373	47·7	33·5	81·2	16·9
1890	525	61·0	25·5	86·5	9·3
1891	522	62·3	24·5	86·8	7·5
1892	488	59·4	31·2	90·6	6·8
1893	480	60·8	28·6	89·4	7·1

Fishery Barometers.

Fishery Barometers.—To add to the means available to the sea-going population for obtaining warnings of stormy weather barometers have for many years been supplied by the Office on loan to fishing villages and other places on the coast, to be set up for public information. The whole number of stations provided by the Office with these instruments is 198. Of these 63 are in England, 7 in Wales, 57 in Ireland, 66 in Scotland, 4 in the Isle of Man, and 1 in Jersey. The list is given in Appendix IX., p. 60.

PART III.

Land Meteorology of the British Isles.

Observatories and Stations.—The observations of the climate of the British Isles, which are received by the Office from certain stations, may be arranged in five classes, according to the degree of completeness with which they are made.

Self-recording observatories.

1. Seven Observatories, furnished with self-registering instruments by which all the principal meteorological phenomena are recorded continuously. These alone afford the materials necessary for the study of the periodic variations of the meteorological elements.

Anemographic stations.

2. Nine Anemographic stations furnished with instruments registering the wind only. The records from these stations relate rather to weather as distinguished from climate, and are especially important in connexion with storms. They are often useful in affording evidence available in courts of law with respect to collisions at sea, and to damage done by wind.

Stations of Second Order.

3. Seventy-four stations of the Second Order, furnishing climatological information from eye observations taken twice a day. The observers at these stations are all volunteers.

Telegraphic Reporting Stations.

4. Thirty-two Telegraphic Reporting Stations, at which the observations are taken by eye, but supplemented in some cases by self-recording aneroids, &c., and supply the material upon which the daily weather reports and forecasts are based. The hours of observation at these stations are determined by the requirements of the telegraphic system, as explained in Part II., but the data which they furnish are also utilized to afford climatological information for parts of the country where Stations of the Second Order do not exist.

5. Extra stations furnishing returns with less completeness and detail than those of Class 3. Extra stations.

A continuous record of the amount of bright sunshine is received from 46 stations in the British Isles, of which some are First or Second Order stations, whilst from others the sunshine record alone is received. A return of the daily duration of sunshine is also received. See Appendix XI. (p. 64). Sunshine stations.

A fuller account of the methods employed by the Office in dealing with these records will be found in Appendix X. (p. 63).

Appendix XI. (p. 64) contains a list of the stations furnishing information relating to the land meteorology of the British Isles during the year. Documents received.

Inspection of the Stations.—The self-recording observatories and the anemographic stations (Classes 1 and 2), as well as the Telegraphic Reporting Stations (Class 4), are regularly visited each year by the Inspectors of the Office. The extra stations (Class 5) are inspected as opportunity offers. Of the Stations of the Second Order (Class 3), some belong to the Royal Meteorological Society, and these are visited by an Inspector appointed by that Society, an allowance being made by the Office toward the cost of the inspection, in accordance with the recommendation of the Treasury Committee (1877). The remaining Stations of the Second Order, including those belonging to the Scottish Meteorological Society, are visited, most of them annually, by the Inspectors of the Office. The inspection of the self-recording observatories was carried on by Mr. T. W. Baker and Mr. E. G. Constable from the Kew Observatory. Inspection of stations.

Extracts from the reports of the Inspectors are given in Appendix V. p. 33.

Information supplied to the General Register Office, Dublin.—Reports from the Irish stations of the Office have been regularly supplied to the Registrar General for Ireland, for his Weekly and Quarterly Returns. Reports supplied to Registrar General for Ireland.

The Weekly Weather Report, which is prepared in the Telegraphic Branch of the Office (see Appendix VI., p. 52), supplies, by its synchronous charts and Monthly Summaries, a very complete and instructive view of the chief meteorological changes, day by day, over the greater part of Europe, such as is not believed to be found in the similar publications issued by any other office. Publications.

Appendix I. to the Weekly Weather Report for 1893 gives a summary for each quarter, and for the whole year, of the Rainfall and Temperature for each district, for the 28 years 1866–1893, and also the Monthly and Progressive values of Accumulated Heat, Rainfall, and Bright Sunshine for all the districts in each month of 1893. Appendix II. to the same Report gives the Weekly and Progressive values for the same elements during the year 1893 (in continuation of Appendix II. for the year 1892).

Hourly Readings of Meteorological Instruments.—The Volume of Hourly Means for 1891 is ready for press, and that for 1892 has been commenced. Hourly Readings of Meteorological Observations.

The volume for 1891 contains, in addition to what has appeared in previous volumes, results for Fort William Observatory, and also hourly records of sunshine for all the observatories.

There is further a special appendix giving the results of ten years hourly tabulation of the sunshine recorded in the ten years 1881–90, at the seven observatories, as announced in last Report.

Volumes for publication.

Observations at Stations of the Second Order.—The volume for 1890 is now issued.

As regards the detailed publication on Form A., the list of stations is the same as that for 1889 with the exception of the Orkney Station, which was removed in 1890 from Swanbister to Stenness, 4 miles to the N.W. With regard to the B. Stations (monthly means and summaries) the list has been increased by three, viz.,

Edinburgh—R. Mossman, F.R.S.E., F.R. Met. Soc.
Ladylaw (Hawick)—W. R. Wilson, Esq.
Parkstone (near Bournemouth)—R. Hawkesworth Barnes, B.A., F.R. Met. Soc.

And reduced by one, Cramlington.

Miscellaneous.

Anemometer Experiments

Anemometer Experiments.—Experiments have been in progress during the year with the Dines' pressure-tube anemometer, erected on the roof of the Office in Victoria Street to test its indications. The result of these experiments are more fully dealt with in Note A., p. 20, but the Council are about to erect a second instrument by the side of the first in order to make some comparative experiments during the coming winter, with a view to testing the effect of varying the length of the tube, contracting its bore, and possibly some other points which it is considered desirable to further elucidate, before arriving at a definite opinion concerning the merits of this instrument and the best form to give to it.

Sunshine Values

Sunshine of the British Isles.—The tabulation of the hourly values of sunshine for the seven observatories from the year 1881 has been completed, and the mean values for the years 1881–90 will, as mentioned above, be published in the volume of "Hourly Means" for 1891.

Hourly Mean Values

Hourly Mean Values of Pressure and Temperature.—The calculations of the mean hourly values of these elements for the seven observatories for the 15 years 1869–1883, and for four of the observatories for the further period of three years 1884–1886, has been completed, and are now ready for discussion preparatory to publication.

Rain Values for the British Isles

Rainfall Means for the British Islands.—Considerable progress has been made with this work during the year. The stations for which the monthly and annual values are to be published have been very carefully selected—so that the general distribution of rainfall over our Islands—for the 10 years 1881–90—is well represented, and for a large number of the stations values for the decade 1871–80, or for the lustrum 1876–80, will also be published.

The total number of stations for which the values for 1881–90 will be furnished is, approximately, as follows:—

England and Wales - - -	250
Scotland - - - - -	140
Ireland - - - -	36

The greater part of the volumes have already been received, many of them are in type, and the checking and arrangement of the remainder are being proceeded with as quickly as possible.

Library.

The library contains standard works on Meteorology and the allied Sciences, and is, besides, particularly rich in Transactions, Proceedings, Reports and other Publications which give a large mass of Meteorological observational data from all parts of the world, extending over many years. It consists at present of about 12,500 volumes and pamphlets, exclusive of charts and MS. records of observations. The books and other documents are accessible to scientific men for reference at the Office. Library

Appendix XII., p. 69, contains a list of the additions to the library during the year, which have been catalogued upon cards, and are entered in the reference catalogues under (1) Authors, and (2) Subjects.

Expenditure.

Appendix XIII., p. 93, shows the total receipts and payments of the Council during the year ending 31st March 1894. The amount voted by Parliament was 14,500*l.*, as in the previous year, in addition to which extra receipts from various sources amounting to 856*l.* 14*s.* 10*d.* also became available. Financial

The following abstract of expenditure shows the amount properly chargeable against the Parliamentary grant of the year in question, and its distribution under the various heads, together with the increase or decrease in 1893–94 as compared with the previous year:

Net Expenditure.	1892–93.	1893–94.	Increase.	Decrease.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
General Administration—				
Payment of Council -	998 10 0	991 0 0	—	7 10 0
Secretary - -	840 0 0	840 0 0	—	—
Office - -	798 0 0	798 0 0	—	—
Rent, fuel, and lighting -	720 18 8	703 7 7	—	17 11 1
Allowances to permanent, supernumerary, and non-resident Officers -	476 10 1	387 13 1	—	88 17 0
Expenses incurred in connection with International Meteorological Congress -	2 8 0	—	—	2 8 0
Pensions - -	186 16 4	186 16 4	—	—
Special Observations -	882 14 2	1,051 6 5	168 16 3	—
Land Meteorology -	5,671 8 1	5,657 2 3	—	14 6 3
Weather Information -	5,347 8 8	5,304 5 4	—	43 3 4
Inspections - -	487 7 1	569 6 7	101 19 6	—
Ocean Meteorology -	2,560 6 9	2,553 2 9	592 16 3	—
Total - - £	14,299 10 4	14,099 7 3	913 11 2	168 14 0

In the year 1893–94 the sum of 1,475*l.* 3*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, and rental of private wires.

(Signed) R. Strachey,
Chairman.

NOTE A.

REPORT on the PERFORMANCE of the PRESSURE-TUBE ANEMOMETER on the ROOF of the METEOROLOGICAL OFFICE; by Mr. R. H. CURTIS.

DURING the past 13 months experiments have been carried on at the Meteorological Office with one of the Dines' pressure-tube anemometers described in the report for last year.

The vane of the instrument is placed upon an iron post, erected upon the roof of the Office, at a height of 24 feet above it and 93 feet above the ground; the recording portion being placed in a room on the third floor of the building and connected with the vane by about 70 feet of metal tube.

Apart from the eddies caused by the building on which the anemometer is erected, and which, there is reason to think, are not entirely surmounted at the height at which the vane is placed, the force of the wind is more or less interfered with in different directions by groups of buildings surrounding the Office. From about S.E. through south to S.W., and also from about N.W. to north, the exposure is best, the buildings in those directions being comparatively low or else well removed from the Office. But from north to S.E. the vane is dominated by high buildings close at hand, whilst from about S.W. to N.W., the wind-force is broken by other high buildings, distant only about 50 to 70 yards. The site is, therefore, by no means an ideal one for anemometrical experiments, although perhaps, taking all things into consideration, it fairly represents the conditions which might be looked for in the centre of any large town.

As soon as the instrument was got into operation it was found that modifications were needed in various directions; and, indeed, the chief result which has been obtained thus far has been to suggest improvements in details, the necessity for which could only be ascertained by actual experience, obtained under the conditions in which the instrument was designed to act. None of these alterations affect, in any way, the principle of the instrument, but they have facilitated its adjustment in various directions, and especially have they improved the trace yielded by the recording portion. This has been done by introducing a fine pen which gives a line at once delicate and distinct, and free from any danger of becoming merged in those immediately adjoining it. The importance of this will be understood when it is remembered that every individual gust of wind is recorded by this instrument.

The carrying out of these alterations and improvements, as they suggested themselves, has necessitated dismounting portions of the instrument on several occasions, involving a loss of record extending on the whole over many weeks.

In order to obtain a general idea of the working of the instrument a comparison has been made between the mean hourly velocities obtained from its record at Westminster, and those recorded by the Robinson cup anemometer at the Kew Observatory.

For this purpose it was first necessary to reduce the latter to the equivalent values which would have been obtained had the factor 2·2 been used instead of 3, for the relation between the movement of the cups and of the wind. This was necessary, since the scale of the pressure-tube anemometer is based on the results obtained by Mr. Dines from the experiments made by him with a whirling apparatus, and which led him to conclude that 2·2 was the proper factor for a Robinson cup anemometer of the size and pattern used at Kew. The mean velocities were obtained from the pressure-tube records by estimation.

Of course, the agreement which was looked for between the two records was only of a very general character, considering that the instruments are eight miles apart, in a straight line, and that much of the intervening space is covered with houses. As a matter of fact, it proved to be much closer than was anticipated.

The observations were all grouped under eight points for direction, and the mean velocity was obtained for each point; a reference to the accompanying plan of the Office and its immediate vicinity will fully explain the results obtained and which are shown in the following table:—

Direction of Wind - -	N.		N.E.		E.		S.E.	
	K.	M.O.	K.	M.O.	K.	M.O.	K.	M.O.
Average Velocity -	9·5	9.8	8·5	6·2	8·3	6·1	5·6	6·4
Per centage M.O. ± K.	103		73		73		114	
No. of Observations -	(263)		(184)		(223)		(121)	

Direction of Wind - -	S.		S.W.		W.		N.W.	
	K.	M.O.	K.	M.O.	K.	M.O.	K.	M.O.
Average Velocity -	11·7	11·7	11·5	10·2	8·0	6·8	7·0	6·5
Per centage M.O. ± K.	100		89		85		93	
No. of Observations -	(*267*)		(*1115*)		(*628*)		(*306*)	

Mean of Means (velocity), Kew *8·8* miles per hour. M.O. *8·0* miles per hour.
Total No. of Observations used *3107*.

The slightly higher mean velocity shown by the Meteorological Office instrument with northerly winds is probably due to the fact that the large block of lofty buildings, bearing slightly to the east of north from the Office, deflects the wind when blowing from a little to the west of north along the line of Chapel Street upon the Office, and thus gives it rather more than its due share. On the north-east and east, as already stated, the Office is greatly sheltered by houses from 30 to 40 feet higher, at a very short distance off, and this sufficiently accounts for the low per centages shown by the Office instrument when the wind blows from those points. To the south eastward, and thence round to nearly south-west, the aspect is fairly open, and the buildings adjoining the Office are all comparatively low, and under these points, therefore, the Office per centage rises; the excess over Kew shown under south-east, is most probably due to the fact that while the Office is open in that direction the Kew Observatory is not so, but is considerably sheltered by the town of Richmond, and by the high land which rises steeply up to the park behind it. To the south-west the high building shown in the plan again begins to affect the Office instrument, and the per centage falls still lower with the west winds, in which direction the yet higher hotel buildings stand. To the north-west, however, the buildings are less lofty and are also more remote, and, consequently, the per centage of the velocity at the Office again rises to within 7 per cent. of that yielded by the Kew instrument.

Upon the whole, the comparison is a striking one, and, if it be accepted, it speaks strongly in favour both of the trustworthiness of the pressure-tube instrument and, also, of the mean record yielded by the Robinson cup instrument.

During the ensuing year it is proposed to make some comparative experiments with two pressure-tube instruments, erected under precisely similar conditions as to exposure, but varying the lengths of the tubes connecting the float with the vane, and also the bore of the tubes at certain places. The precise details of the experiments have not, however, as yet been settled.

APPENDIX.

APPENDIX I.

List of Captains and Officers who have sent in Logs classed as "Excellent" during the year ending March 31, 1894. The figures opposite to each show the total number of such Logs which they have returned to the Office during the period that they have been observing.

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Alford, F.	1	S.S. "Monarch."
Andersen, O. E.	10	S.S. "Longhirst."
Angus, T. S.	8	S.S. "Ballaarat."
Armstrong, B. G.	4	S.S. "Pará."
Atkinson, G. W.	8	S.S. "Ganges."
—— S. P. H.	7	"Osborne."
Bett, Dr. W., R.N.	3	H.M.S. "Stork."
Blackburne, H. S.	12	S.S. "Bombay."
Bolton, S. H.	16	S.S. "El Dorado."
Bourke, Capt. E. G., R.N.	9	H.M.S. "Ringarooma."
Bright, H.	8	Barque "Beltana."
Buchan, J.	23	S.S. "Deramore."
Cameron, J. G., R.N.R.	10	S.S. "Germanic."
Campbell, J.	9	"Balmoral."
—— J. J. W. (Surgeon)	1	S.S. "Diana."
Chesshire, G. H.	2	S.S. "Aldgate."
Crowley, C.	7	"Verajean."
Cust, Lieut. and Comr. H.E.P., R.N.	1	H.M.S. "Dart."
Dart, L. C.	14	Barque "Alcides."
Davidson, D. C.	1	"Loch Rannoch."
—— R.	1	S.S. "Diana."
Davis, G. W.	1	S.S. "Alberta."
De Horne, M.	4	S.S. "Carthage."
Docherty, H.	5	Barque "Tinto Hill."
Elliott, Mr. C.	2	S.S. "Wilcannia."
England, T.	14	Barque "Glen Grant."
Exham, T. K., F.R.A.S.	15	S.S. "Tamar."
Field, Comr. A. M., R.N.	12	H.M.S. "Egeria."
Fraser, C.	1	S.S. "Massilia."
—— W. D.	7	"Corolla."
Hepworth, M.C.W.	11	S.S. "Port Denison" and S.S. "Port Victor."
Jamieson, D. E.	2	S.S. "Port Adelaide."
Kemp, A. H.	6	Barque "Hudson."

Name of Captain or Officer.	Number of "Excellent" Logs.	Ship.
Lehman, C.	4	"Loch Sloy."
Lewes, Lieut. P. V., R.N.	1	H.M.S. "Blanche."
Lindley, G. R., R.N.	1	H.M.S. "Blanche."
McKinstry, E. R., R.N.R.	1	S.S. "Germanic."
Marescaux, Lieut. A. E. H., R.N.	1	H.M.S. "Dart."
Margesson, Lieut. W. H. D., R.N.	2	H.M.S. "Egeria."
Martin, Walter, R.N.R.	6	S.S. "German."
Millican, J. W.	8	S.S. "Loughrigg Holme."
Milne, W. F.	10	S.S. "Eclipse."
Milner, W. H.	17	S.S. "Trent."
Mitchell, George	5	S.S. "California."
—— J.	3	Barque "Cape York."
Moignard, P.	7	"Garsdale."
Molony, E. J.	11	"British Merchant."
Murdoch, Peter	14	"Sierra Lucena."
Murray, A., junr.	2	Barque "Perseverance."
—— R. G., R.N.R.	1	S.S. "Britannia."
Nicol, R.	2	S.S. "Germanic."
Parry, M.	18	S.S. "Prydain."
Parson, G. F.	12	"Earnock."
Pentin, W.	2	S.S. "Wilcannia."
Philip, W., junr.	1	"Salamis."
Pope, J.	9	S.S. "Essequibo."
Price, J. H.	7	"Othello."
Randall, W.	14	"Laomene."
Robertson, T.	1	S.S. "Active."
Rosseter, W. L.	16	"Brenda."
Sargent, A. H.	7	"Pleione."
Scott, G. P.	10	"Crompton."
Simpson, Alexander	16	S.S. "Thermopylæ."
—— Alexander	23	S.S. "Traveller."
Smith, J.	2	S.S. "Dunera."
Smyth, Comr. M. H., R.N.	3	H.M.S. "Stork."
Spalding, T. F.	5	S.S. "Australasian."
Streater, R.	4	"Euterpe."
Thompson, J. E. (the late)	5	S.S. "Monarch."
Trott, S., F.R.Met.Soc.	25	S.S. "Minia."
Tyson, J.	2	S.S. "Arab."
Walker, H., R.N.R.	18	S.S. "Aurania" and S.S. "Etruria."
Warden, W.	6	S.S. "Pembroke Castle."
White, W. E., R.N.R.	9	S.S. "Ormuz."
Wilson, J., R.N.R.	10	S.S. "Circassia."

APPENDIX II.—Ships supplied and Documents returned during the year ending 31st March 1894.

The number of merchant ships supplied with standard instruments and meteorological logs during the above period was 111.

The number of logs and documents from Foreign Stations, received during the same period, and registered in the Office, amounted altogether to 371, of which 183 were returned from ships, and the remainder from land stations, outside the British Isles.

List of Documents received from Foreign Land Stations.

Place.	Observer.	No. of Documents.	Nature of Observations.
Abaco (Bahamas) - -	Lightkeepers - -	2	Lighthouse Register, 1893, January to December.
Aburi (Gold Coast) - -	F. E. Willey - -	1	Two observations daily, 1893, October.
Accra (Gold Coast) - -	J. F. Easmon, M.D. -	1	Rainfall for April 1893 and monthly totals for 1888–93.
„ „ - -	„ „ - -	1	Two observations daily, 1893, October.
Antigua - - - -	Francis Watts - -	10	„ „ „ 1893, March, May to December; 1894, January, February.
Beyrout (Lee Observatory) -	R. H. West, M.A. - -	12	Two observations daily, 1893, March to December; 1894, January, February.
Breaksea Island (King George's Sound).	J. A. Symonds - -	2	Lighthouse Register, 1893, January to December.
Cape Juby (N.W. Africa) -	W. B. Silverwood and F. S. Zaytoun.	11	Two observations daily, 1893, March to December; 1894, January.
Cape Pembroke (Falkland Islands)	G. K. Broom, Lightkeeper -	2	Lighthouse Register, 1893, January to December.
Cape Spartel (Tangier) - -	E. C. Hathaway, Lloyd's Signalman.	5	Two observations daily, 1893, May to December; 1894, January, February.
Cay Lobos (Bahamas) - -	Byron N. Jones, Lightkeeper	3	Lighthouse Register, 1892, July to December; 1893, January to December.
Cay Sal (Bahamas) - -	T. R. Thompson, Sen., Lightkeeper.	2	„ „ 1892, „ „ „ June.
Famagusta (Cyprus) - -	G. Eliades - - -	4	Two observations daily, 1893, February to May.
Futuna (New Hebrides) - -	Rev. W. Gunn, L.R.C.P. -	3	Notes of Cyclones on 28th, 29th January 1889, 15th January 1893, and 20th and 21st February 1893.
„ „ - -	„ „ -	2	Three observations daily, 1888, August, October to December; 1889, January.
„ „ - -	„ „ -	4	Two observations daily, 1892, October to December; 1893, January to July.
George Town (British Guiana) -	Robert Ward - -	5	„ „ „ 1893, January to December.
Gibraltar - - - -	Staff-Sergeant R. Scott, Med. Staff Corps.	11	„ „ „ 1893, March to December; 1894, January, February.

LIST of DOCUMENTS—*continued.*

Place.	Observer.	No. of Documents.	Nature of Observations.
Inagua (Bahamas) - -	J. W. Roberts, Lightkeeper -	2	Lighthouse Register, 1893, January to December.
Kaneohe (Oahu) - -	H. Cobb-Adams - -	3	Two observations daily, 1893, January to June, September to November.
Kyrenia (Cyprus) - -	M. Fuleiham and P. Michaelides.	4	„ „ „ 1893, February to May.
Lagos - - - -	Wm. A. Cole - -	12	„ „ „ 1893, February to December; 1894, January.
Larnaca (Cyprus) - -	C. Perini - - -	4	„ „ „ 1893, „ May.
Limassol (Cyprus) - -	Luigi Béraud - -	4	„ „ „ „ „ „
Mojanga (Madagascar) - -	Stratton C. Knott, Vice-Consul.	11	„ „ „ „ „ December.
Malden Island - - -	- - - -	1	Three „ „ 1892, May to December; 1893, January, February.
Nicosia (Cyprus) - -	G. Stephen - - -	4	Two „ „ 1893, February to May.
Papho (Cyprus) - - -	E. A. Malliotis - -	4	„ „ „ „ „ „
Point King (King George's Sound).	S. Mitchell - - -	2	Lighthouse Register, 1892, November to December; 1893, January to November.
Principe Island (West Africa) -	G. R. Scovell - -	6	Two observations daily, 1893, February to December; 1894, January.
St. Helena - - -	H. S. Hands - -	10	One observation daily, 1893, February to December.
„ - - -	„ - -	7	Continuous record of wind (direction and velocity), 1893, February, April, May, July to September; 1894, January.
Sultan Tchair (Asiu Minor) -	C. Z. Bunning - -	3	Two observations daily, 1893, December; 1894, January, February.
Suva (Fiji) - - -	J. D. W. Vaughan, F.R.Met. Soc., F.R.G.S.	8	One observation daily, 1893, January to October.
Teneriffe (Sitio de Cullen) -	A. F. Perry - -	11	Two observations „ 1893, March to December; 1894, January, February.
Tobago - - - -	J. P. Tulloch, M.A., M.D. -	2	„ „ „ 1893, February to June.
Tonga (New Hebrides) - -	A. Cronstedt - -	2	„ „ „ 1893, October to December.
Trinidad - - - -	J. H. Hart, Supt. Botanic Gardens.	6	„ „ „ 1892, July to December; 1893, January to November.
Watling Island (Bahamas) -	T. R. Thompson, jun., Lightkeeper.	1	Lighthouse Register, 1893, January to June.

LIST of DOCUMENTS received from SHIPS.

	Captain's Name.	Ship.	Voyage.	Year.
1	Adamson, A. W.	S.S. Victoria	Sydney, viâ Suez	1893
2	„ „	„	Australia, viâ Suez	1893–94
	Alford, F.	S.S. Monarch	Off coasts of British Isles	1893
	Andersen, O. E.	S.S. Longhirst	New York and Continental Ports	1893
	„ „	„	Quebec, Continental Ports, &c.	1893–94
3	Angus, T. S.	S.S. Ballaarat	Australia, viâ Suez	1893
4	„ „	„	„ „	1893
4	„ „	„	Bombay	1893–94
5	Armstrong, B. G.	S.S. Pará	West Indies	1893
6	„ „	„	„	1893
	Asquith, W.	S.S. Deucalion	Batavia	1891–92
7	Atkinson, G. W.	S.S. Ganges	Calcutta, viâ Suez	1893
	„ „	„	„ „	1893
8	„ „	„	China, viâ Suez	1893–94
	„ S. P. H.	Osborne	Calcutta	1892–93
9	Barker, D. W., R.N.R.	Training ship Worcester	Off Greenhithe	1893
	Barr, J.	S.S. Orestes	Batavia, viâ Suez	1891
	Bartlett, T.	S.S. Laertes	China, viâ Suez	1891
	Barwise, J.	S.S. Sarpedon	China, viâ Suez, and Java, viâ Suez	1890–91
	Batt, H. E.	S.S. Hector	„ „ „ „	1890–91
	Beeching, C.	Barque Ellesmere	San Francisco	1893–94
10	Blackburne, H. S.	S.S. Bombay	Bombay, viâ Suez	1893
11	„ „	S.S. Brindisi	„ „	1893
12	„ „	S.S. Malwa	Bombay and Shanghai, viâ Suez	1893
	Bolton, S. H.	S.S. El Dorado	Continental Ports	1893
	Bourke, E. G., R.N.	H.M.S. Ringarooma	New Zealand	1892–93
	Bright, H.	Barque Beltana	Adelaide	1893–94
	Brown, R. J.	S.S. Titan	China, viâ Suez	1891
13	Buchan, James	S.S. Deramore	New York, Algoa Bay, Rangoon, and Suez	1893
14	Cameron, J. G., R.N.R.	R.M.S. Germanic	New York	1892
15	„ „	R.M.S. Teutonic	„	1893
	Campbell, James	Balmoral	Calcutta	1892–93
16	Chesshire, G. H.	S.S. Aldgate	Bombay, viâ Suez	1893
16	„ „	„	Karachi	1893
17	„ „	„	Bombay, viâ Suez	1893–94
18	Clunie, James	S.S. Transvaal	Cape Town, Bombay, viâ Suez, and Calcutta	1893
	Crowley, C.	Verajean	Lyttleton	1892–93
19	Crutchley, W. C., R.N.R.	S.S. Kaikoura	New Zealand, viâ Cape Town, and Rio Janeiro	1893
20	Cust, Lieut. and Comr. H. E. P., R.N.	H.M.S. Dart	New Hebrides and New Caledonia	1892
	Dart, L. C.	Barque Alcides	San Francisco	1892–93
	Davidson, D. C.	Loch Rannoch	Melbourne	1892–93
21	„ James	Barque Polar Star	Antarctic Seas	1892–93
22	„ Robert	S.S. Diana	„	1892–93
	Davies, Llewellin	Barque Lady Wolseley	Iquique	1892–93
	Davis, G. W.	S.S. Alberta	Bombay, viâ Suez	1893
23	De Horne, Morris	S.S. Carthage	China, viâ Suez	1893
24	„ „	„	Bombay, viâ Suez	1893
	Dermody, W. J.	Highland Forest	Calcutta, Lyttleton (N. Z.)	1892–93
	Dickens, E. G.	S.S. Diomed	China and Japan, viâ Suez	1891
	„ „	S.S. Stentor	Liverpool and Glasgow	1891
25	Dickinson, L. R.	S.S. Medway	Barbados	1892–93
25	„ „	„	„	1893–94
	Docherty, Hugh	Barque Tinto Hill	Chittagong	1893–94
27	Dulling, George	S.S. Port Pirie	Australia viâ Cape of Good Hope	1893
	Elder, William	S.S. Nestor	China and Japan, viâ Suez	1890
	England, Thomas	Barque Glen Grant	Apalachicola	1892–93

	Captain's Name.	Ship.	Voyage.	Year.
	England, Thomas	Barque Glen Grant	Apalachicola	1892–93
	Evans, J. C.	Barque Peri	Brisbane and New Zealand	1892–93
2	Exham, T. K.	R.M.S. Tamar	East Coast of South America	1892–93
2	„ „	„ „	„ „ „	1893
28	Fairweather, Alexander.	S.S. Balaena	Antarctic Seas	1892–93
29	Field, Comr. A. M., R.N.	H.M.S. Egeria	Hong Kong and Macclesfield Bank	1893
29	„ „	„	Borneo	1893
	Fordyce, W	County of Roxburgh	Mauritius and Calcutta	1893–94
30	Fraser, C.	S.S. Massilia	Bombay, viâ Suez	1893
30	„	„	Australia, viâ Suez	1893–94
31	„ Duncan	S.S. Bellenden	East Coast of South America	1893
	„ W. D.	Corolla	West Coast of South America	1892–93
	Goldsmith, O. S.	Barque Ariel	Brisbane and Callao	1892–93
	Gregory, T. M.	S.S. Menelaus	Java, viâ Suez	1891
	Hannah, W. T.	S.S. Glaucus	China, viâ Suez, and Java, viâ Suez	1891
	Hannay, C. E.	Simla	Towards San Francisco	1892
32	Henderson, F. F., R.N.	R.Y.S. Valhalla	Madeira and Mediterranean Ports	1893
2	Hepworth, M. C. W.	S.S. Port Denison	Sydney, viâ Cape, and home, viâ Suez.	1892–93
33	„ M. C. W.	S.S. Port Victor	Adelaide, viâ Cape, and home, viâ Suez.	1893–94
	Hutchinson, J. P.	S.S. Stentor	Java, viâ Suez	1891
	Ismay, A. J.	Barossa	Adelaide	1892–93
	Jackson, C.	S.S. Palamed	China, viâ Suez	1891
	„ M. H. F.	S.S. Telamon	„	1891
	„ T. S.	S.S. Palinurus	„	1891
	Jamieson, D. E.	S.S. Port Adelaide	New York, China, Japan, viâ Suez	1892–93
34	„ „	S.S Port Pirie	Australia, viâ Cape, and home, viâ Suez.	1893–94
	Jones, Henry	S.S. Telemachus	China and Japan, viâ Suez	1891–92
35	„ J. H.	Andora	Wilmington (Cal.), San Pedro, and Tacoma (U.S.A.).	1892–93
	„ P. H.	City of York	Callao and Astoria	1893–94
	Kemp, A. H.	Barque, Hudson	Otago	1892–93
	Lapage, W. P.	S.S. Anchises	East Indies	1891–92
	Lawrison, G. M.	Eaton Hall	San Francisco	1892–93
	Lehman, Charles	Loch Sloy	Melbourne	1892–93
36	Lindley, G. R., R.N.	H.M.S. Blanche	Aden, India, and Zanzibar	1891
	McGregor, James	S.S. Glenartney	China and Japan, viâ Suez	1893
	„ „ „	„ „ „	„ „	1893–94
14	McKinstry, E. R., R.N.R.	R.M.S. Germanic	New York	1893
37	Marshall, W. H.	Barque Elvira	Fernandina (Florida) and Rosario	1892–93
	Martin, T. C.	Loch Tay	Melbourne	1893–94
38	„ W., R.N.R.	S.S. German	Mauritius, viâ Cape Town	1892–93
38	„ „ „	„ „	Cape Town	1893
9	Miller, A. T., R.N.	School Ship Conway	Off Birkenhead	1893
2	Millican, J. W.	S.S. Loughrigg Holme	Galveston, Hamburg, New York, and Montreal.	1893
	Milne, W. F.	S.S. Eclipse	Davis Straits	1893
	Milner, W. H.	R.M.S. Trent	East Coast of South America	1892–93
39	„ „	„ „	„ „	1893
40	„ „	„ „	„ „	1893–94
	Mitchell, George	S.S. California	Venice, New York, and New Orleans.	1892–93
	„ „	„ „	New Orleans, Mediterranean Ports, and New York.	1893
	„ John	Barque Cape York	Newcastle (N.S.W.), San Francisco, and Dunkirk.	1892–94
	Moignard, Philip	Garsdale	California, Tacoma (U.S.A.)	1892–93
	Molony, E. J.	British Merchant	Melbourne, Newcastle (N.S.W.), Colombo, and Wallaroo.	1892

	Captain's Name.	Ship.	Voyage.	Year.
41	Morton, D.	S.S. Silvertown	West Coast of South America	1893
42	Moseley, F. J.	S.S. Anglian	Cape Town, Zanzibar, &c.	1893–94
	Murdoch, Peter	Sierra Lucena	Chittagong and Akyab	1892–93
	Murray, Alexander, junr.	Barque Perseverance	Hudson's Bay and Repulse Bay	1892–93
43	Murray, R. G., R.N.R.	S.S. Britannia	Australia, viâ Suez	1892–93
	Nelson, R.	S.S. Myrmidon	China, viâ Suez	1891–92
	Nicholson, J. I.	Majestic	Calcutta	1892–93
	Nicol, Robert	R.M.S. Germanic	New York	1892–93
	„ „	„ „	„ „	1893
2	Niles, W. H.	Ben Cruachan	Buenos Aires and Chile	1892–93
	Nish, H.	S.S. Cyclops	East Indies	1891
	Parry, Moses	S.S. Prydain	Mediterranean Ports and New York.	1892–93
	Parson, G. F.	Earnock	New York, Shanghai, and Boston	1892–93
44	Patterson, J. A.	Barque Dunstaffnage	Calcutta	1893
	„ William	Barque Lindfield	Melbourne	1893
	Pattman, R.	Barque Loch Torridon	„	1892–93
	„ „	„ „	„	1893–94
45	Payne, C. J.	S.S. Elton	Norfolk (U.S.A.), and Bombay, viâ Suez.	1893–94
46	Pentin, Walter	S.S. Wilcannia	Adelaide, viâ Cape of Good Hope, and home, viâ Suez.	1893
46	„ „	„ „	„ „ „	1893
	Philip, William, junr.	Salamis	Melbourne	1893–94
47	Pope, J.	S.S. Essequibo	West Indies	1893
	Price, J. H.	Othello	Melbourne	1892–93
	Pulford, I.	S.S. Patroclus	China, viâ Suez	1891
	Purdy, Thomas	S.S. Dardanus	„ „	1891
	Randall, W.	Laomene	New York, Batavia, and Calcutta	1892–93
	Rawlings, E. S.	S.S. Ajax	China, viâ Suez	1891
	Richards, Comr. G. E., R.N.	H.M.S. Triton	Off East coast of England	1893
48	Rigaud, H. C.	R.M.S Magdalena	River Plate, Lisbon, and Brazils	1892–93
	Riley, J.	S.S. Teucer	China, viâ Suez	1890–91
49	Robertson, Lieut. and Comr. C. H., R.N.	H.M.S. Herald	Shiré and Zambesi Rivers	1892
50	Robertson, „ „	„ „	„ „ „	1893
	„ Thomas	S.S. Active	Antarctic Seas	1892–93
	Rohde, H.	Barque Archdale	Port Townsend, Australia, San Diego (Cal.), and Tacoma.	1892–93
	Rosseter, W. L.	Brenda	Calcutta, Demerara, and New York	1893
	„ „	Ship Sheila	From West Indies	1894
2	Sargent, A. H.	Pleione	New Zealand	1892–93
	Scale, R. F.	S.S. Laertes	China, viâ Suez	1890–92
51	Scott, G. P.	Crompton	Colombo and Rangoon	1893
	Simpson, Alexander	Barquentine Traveller	Ivigtut	1893
	Simpson, Alexander	S.S. Thermopylæ	Melbourne, viâ Cape Town	1893
	„ „	„	Australia, viâ Cape Town	1893–94
52	Slade, Albert	County of Inverness	Calcutta	1892–93
	Smith, Alexander	Barque Carradale	Algoa Bay, Bangkok	1890–91
2	„ James	S.S. Dunera	Calcutta, viâ Suez	1893
2	„ „	„	„ „	1893
53	„ W. J.	R.M.S. Tagus	Brazil	1892–93
54	„ „	„	Buenos Ayres	1893
55	„ „	„	Monte Video	1893
56	Smyth, M. H., R.N.	H.M.S. Stork	Malta	1893
57	„ W. H.	S.S. Anglian	Mauritius, viâ Cape Town	1893
58	Spalding, T. F.	S.S. Australasian	Australia, viâ Cape Town	1892–93
59	„ „	„	Melbourne, viâ Cape Town	1893
	Streater, R.	Euterpe	Otago	1892–93
	Suffern, R.	Craigerne	Cape Town, Newcastle (N.S.W.), San Diego, and Portland (Oregon).	1892–93

	Captain's Name.	Ship.	Voyage.	Year.
	Thompson, J.	S.S. Nestor	China, Japan, viâ Suez	1891
[59]	„ J. E.	S.S. Monarch	Off coasts of British Isles	1893
	Tree, Thomas, R.N.R.	S.S. Port Chalmers	From Sydney, viâ Suez	1893
[60]	Trench, F. P., R.N.	H.M.S. Royal Arthur	Rio Janeiro, Callao, &c., and Esquimalt.	1893
[61]	Trott, Samuel	S.S. Minia	Halifax, N.S.	1893
[61]	„ „	„	Halifax	1893
[61]	„ „	„	North Atlantic, Halifax, and Nova Scotia.	1893
[62]	Tyson, John	S.S. Arab	Cape Town, Mauritius, and Madagascar.	1892–93
[63]	„ „	„	Cape Town	1893–94
	Walker, Henry	S.S. Aurania	New York	1892
	„ „	S.S. Etruria	„	1893
	„ „	„	„	1893
	Warden, William	S.S. Pembroke Castle	Mauritius, viâ Cape Town	1892–93
	Webster, I. K.	S.S. Prometheus	China, viâ Suez	1891
[64]	White, W. E., R.N.R.	S.S. Ormuz	Australia, viâ Suez	1893
[65]	„ „ „	„	„ „	1893
	„ „ „	„	„ „	1893–94
	Widdess, A.	S.S. County Down	Genoa, Danube, Antwerp, and Brazil.	1892–93
	Wilding, J.	S.S. Priam	China, viâ Suez	1890–91
[66]	Williams, John	Barque Elissa	Buenos Ayres	1892
	„ O. P.	S.S. Agamemnon	China, viâ Suez	1891
	Wilson, John, R.N.R.	S.S. Circassia	New York	1893
	„ W.	Crocodile	Port Pirie	1892–93
	Wishart, J. T.	Sierra Parima	San Francisco	1893
[67]	—	Barque Oribe	From Mauritius	1872–73

In cases distinguished by marginal numbers the Meteorological Registers were kept chiefly by Officers, as follows:—

[1] Kept by C. Kay.
[2] Assisted by Officers.
[3] Kept by S. B. de Lockyer, 1st Officer, G. Cockman, 2nd Officer, and C. E. Carter, 3rd Officer.
[4] Assisted by S. de B. Lockyer, 1st Officer, — Scott, 2nd Officer, and C. E. Carter, 3rd Officer.
[5] Kept by G. B. M. Eldridge, 4th Officer.
[6] Kept by G. A. Mackenzie, 4th Officer.
[7] Assisted by Messrs. Sweeney and Burroughs.
[8] Assisted by Messrs. Bracken and Uwood.
[9] Kept by the Cadets.
[10] Assisted by A. B. Armitage, 2nd Officer, H. R. Hetherington, 3rd Officer, and J. C. W. Stanley, 4th Officer.
[11] Assisted by T. Summers, 1st Officer, P. MacLean, 2nd Officer, and K. Dixon, 3rd Officer.
[12] Assisted by N. P. Pollock, 1st Officer, E. Simmonds, 2nd Officer, and W. Warren, 3rd Officer.
[13] Kept by Henry Ward, 1st Officer, and Henry Mouat, 2nd Officer.
[14] Kept by J. R. Lay, 3rd Officer.
[15] Kept by 4th Officer.
[16] Kept by William F. Pollard.
[17] Kept by Charles Louis.
[18] Kept by W. M. Wright, 2nd Officer.
[19] Kept by H. W. Armstrong, 4th Officer.
[20] Kept by Lieut. A. E. H. Marescaux, R.N.
[21] Kept by Robert Walker, Mate.
[22] Kept by John J. W. Campbell, Surgeon.
[23] Kept by A. E. House and E. A. Forbes.
[24] Kept by Charles James Fox, 5th Officer.
[25] Kept by H. G. Warren, 3rd Officer, T. Barrett, and J. V. Fenn, 4th Officers, and J. Brander and E. Simpson, 5th Officers.
[26] Kept by William Anderson and L. Coxwell.
[27] Kept by William Lewis, 2nd Officer.
[28] Kept by William S. Bruce, Surgeon.
[29] Kept by W. H. D. Margesson, Lieut., R.N.
[30] Kept by the Officers.
[31] Kept by A. J. Anderson, 3rd Officer.
[32] Kept by A. Bernard Crosse, R.N.R., 2nd Mate.
[33] Assisted by Messrs. R. Walton, G. Pattrick, and F. E. Cope.
[34] Kept by Herbert S. Brading, 2nd Officer.
[35] Kept by E. G. W. Cummings.
[36] Kept by Lieut. P. Vaughan Lewes, R.N.
[37] Kept by C. M. Redhead and W. Johnstone.
[38] Kept by J. George, R.N.R., 3rd Officer.
[39] Assisted by H. W. Stump, 3rd Officer.
[40] Assisted by Messrs. Warren, 2nd Officer, Stump, 3rd Officer, and Cochrane, 4th Officer.
[41] Kept by B. C. Coombe, Navigating Officer.
[42] Kept by J. Vessey Lawther, 4th Officer.
[43] Kept by Sidney G. D. Andrews, Chief Officer.
[44] Kept by T. Gray, Chief Mate.
[45] Kept by J. Sowerby, 1st Mate, and D. Jones, 2nd Mate.
[46] Kept by Coulton Elliott.
[47] Kept by M. Pearson.
[48] Kept by L. W. Bollard, 5th Officer.
[49] Kept by Evan St. Maur Nepean, Surgeon, R.N.
[50] Kept by Elrington S. McKay, Surgeon.
[51] Assisted by J. J. Murphy and F. Lampard.
[52] Kept by W. H. Taylor, 1st Officer.
[53] Kept by W. S. Preedy, 2nd Officer, and F. W. Fooks, 4th Officer.
[54] Kept by George Adams and H. J. Boby.
[55] Kept by H. J. Boby, 2nd Officer, H. V. Lewis, 3rd Officer, and E. Simpson, 4th Officer.
[56] Kept by William Bett, Surgeon, R.N.
[57] Kept by B. C. Alleyne, 2nd Officer.
[58] Kept by Andrew Robb, 2nd Officer.
[59] Kept by Navigating Officers.
[60] Kept by Lieut. A. Y. Moggridge, R.N.
[61] Kept by William George Squares, Chief Officer.
[63] Kept by John W. Hague, Chief Officer.
[63] Kept by E. L. Travers, 2nd Officer.
[64] Assisted by Messrs. Hoare, Gace and Coysh.
[65] Assisted by Messrs. Hoare, Gace, Hepburn and Shirfield.
[66] Kept by John M. Arnaud.
[67] Kept by James Smith, 1st Mate.

APPENDIX III.

Instruments supplied, &c. to the Royal Navy.

Per Account.	Barometers.	Aneroids.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1893, afloat - -	227	532	1,396	309	313	185	93
Issued since - -	80	143	362	80	77	30	28
	307	675	1,758	389	390	215	121
Returned since - -	65	102	315	45	36	18	31
April 1st, 1894, afloat -	242	573	1,443	344	354	197	90

Instruments supplied, &c. for use at Naval Stations.

April 1st, 1893, in use -	73	65	254	36	38	7	13
Issued since - -	7	5	48	4	3	3	1
	80	70	302	40	41	10	14
Returned since - -	3	5	66	8	2	1	3
April 1st, 1894, in use -	77	65	236	32	39	9	11

Disposition of Admiralty Instruments on April 1st, 1894.

Afloat in Royal Navy - -	242	573	1,443	344	354	197	90
In use at stations - -	77	65	236	32	39	9	11
In store at M.O. - -	24	55	48	45	54	9	28
,, Chatham - -	16	45	81	5	8	11	15
,, Sheerness - -	6	6	38	14	14	9	6
,, Portsmouth -	23	53	143	33	35	13	8
,, Devonport -	20	45	126	40	40	16	16
,, Queenstown -	2	2	17	—	—	—	4
,, Gibraltar - -	2	4	11	3	3	—	4
,, Malta - -	8	12	33	8	11	3	6
,, Bombay - -	4	4	11	3	3	1	4
,, Halifax - -	1	6	20	5	4	—	7
,, Bermuda - -	13	7	24	4	9	2	4
,, Jamaica - -	6	3	28	—	—	—	—
,, Cape of Good Hope	5	5	27	4	4	3	4
,, Trincomalee -	4	3	14	3	3	—	4
,, Hong Kong* -							
,, Coquimbo -	3	6	17	4	3	1	19
,, Sydney - -	1	5	12	4	3	1	7
,, Esquimalt - -	6	7	29	5	6	—	—
Total, April 1st, 1894 -	463	906	2,358	556	593	275	237
Lost, &c. since April 1st, 1893	4	17	279	46	31	7	10
Under repair - - -	23	4	—	—	—	—	—

* Returns have not been received for June and September quarters 1893.

APPENDIX IV.

Instruments supplied, &c. to Mercantile Marine.

Per Account.	Barometers.	Compasses.	Thermometers.				Hydrometers.
			Ordinary.	Max.	Min.	Screens.	
April 1st, 1893, afloat	116	—	667	—	1	113	378
Issued since	67	—	419	—	—	61	203
	183	—	1,086	—	1	174	581
Returned since	77	—	459	—	—	68	241
April 1st, 1894, afloat	106	—	627	—	1	106	340

Instruments at Stations, viz., Telegraph Offices, Observatories, Fishing Villages, &c.

April 1st, 1893, in use	283	2	258	57	64	55	10
Issued since	14	—	38	10	12	2	—
	297	2	296	67	76	57	10
Returned since	12	—	29	8	7	1	—
April 1st, 1894, in use	285*	2	267	59	69	56	10

Disposition of Board of Trade Instruments on April 1st, 1894.

In merchant ships	106	—	627	—	1	106	340
In use at stations	285	2	267	59	69	56	10
In store at M.O.	39	3	305	20	36	18	123
At Liverpool Agency	9	—	43	—	—	11	33
„ Aberdeen „	5	—	41	—	3	5	30
„ Glasgow „	4	—	26	—	—	3	19
„ Dundee „	16	—	36	—	—	14	33
„ Hull „	2	—	9	—	—	1	4
„ Cardiff „	4	—	38	—	—	2	15
„ Southampton „	6	—	44	—	—	6	29
Total, April 1st, 1894	476	5	1,436	79	109	222	636
Lost, &c. since April 1st, 1893	2	—	114	2	1	33	48
April 1st, 1894	12	—	—	—	—	—	—

* Of these barometers 198 are lent for use of seafaring communities at fishing villages and ports.

APPENDIX V.

Report of Inspection of the Irish and Welsh Stations, 1893.

I have the honour to report that I have completed my usual inspections this autumn. The only stations I have omitted have been Foynes and Kilkenny Castle, both of which furnish data for the Weekly Weather Report only.

Telegraphic Reporting Stations.

Holyhead, visited August 3rd.—The only matter calling for remark here is that the bushes near the rain gauge require to be kept lower, so as not to shelter the gauge from driving rain.

I also inspected the two anemometers, in company with Mr. Galton. Some repairs were needed to the cups of the Robinson instrument, which I ordered to be carried out.

Donaghadee, visited August 8th.—The only change at this station has been that the barometers have been changed to the new Post Office close by the old one. The thermometers have not been changed.

Malin Head, visited August 14th.—I took to this station, where the observer is very careful, the self-recording aneroid formerly at Mullaghmore, and I erected it in the signal tower. The employment of Lloyd's signalmen as our observers is not altogether satisfactory, as at the time of the manœuvres the two duties clashed with each other at this station and elsewhere.

Belmullet, visited August 16th.—At this station the observer was absent on leave. I regret to say that the observations are not as carefully taken as we could wish. I have reprimanded the observer, whom I saw afterwards.

Parsonstown, visited August 22nd.—At this station the observer had recently enlisted, and his brother aged 14 had taken the duty, but of course is as yet inexperienced.

Roche's Point, visited August 23rd.—This station was in good order as usual.

Valencia, visited August 24th.—The records are as usual well kept. The sunshine recorder has been placed on the anemometer tower.

Mr. Cullum has erected some gates, and has brought the place into good order. I have authorised his expending 5*l.* on sanitary improvements, and have also allowed him to put in other gates, at his own expense, if he wishes to do so.

St. Ann's Head, visited August 30th.—This station calls for no remark. Mr. Blake, the senior observer, expects promotion about Christmas.

Stations of the Second Order.

Dublin (*Fitzwilliam Square*), visited August 4th.—This station is as usual in good order, but the shrubs in the garden interfere with air circulation.

Dublin (*Glasnevin Gardens*), visited August 4th.—This station calls for no remark.

Dublin (Mountjoy Barracks), visited August 5th.—This station is in its usual good order. The jackdaws have been taking papers from the sunshine recorder, as had previously happened elsewhere. I have directed that a wire cage be fixed on.

Lissan, visited August 9th.—The observer is the same as in 1892. The thermometer screen has been shifted so as to open to the north. The records are carefully taken.

Armagh, visited August 9th.—I found this station in good order. The anemometer hut on the roof had been moved during the year, and replaced satisfactorily (*vide* my report of 1892).

Colebrooke, visited August 10th.—The station is satisfactory; the reductions are all carried out in this Office.

Londonderry, visited August 12th.—The observer is in arrear with his returns. The thermometers and rain-gauge are in a narrow garden, and bushes interfere with them to some extent.

Markree, visited August 16th.—Mr. Marth's assistant was absent. I found the station in very good order, except that the sunshine recorder was slightly out in azimuth.

Currygrane, visited August 19th.—The observer, S. Leckie, is improving in accuracy, and the records are now well kept.

Arley Cottage, visited August 21st.—Major Maxwell was again absent. The instruments were in fairly good order.

Parsonstown.—See report on Telegraphic Stations.

St. David's, visited August 29th.—This station is, as always, in excellent order.

Weekly Weather Report Stations.

Edenfel, visited August 15th.—Colonel Buchanan absent, but his son was taking the observations, and the instruments were in order.

Killarney, visited August 24th.—Archdeacon Wynne absent. His *locum tenens* was observing, and correctly.

Waterford, visited August 28th.—This station calls for no remark.

Llandovery, visited August 31st.—This station is in good order. Mr. Watkin has, however, better instruments than he has now in use. I hope he will have them set up.

Corrections to be applied to the readings of the thermometers :—

Stations.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.	Remarks.
Telegraphic Reporting Stations.						
Holyhead	°0·0	°−0·3	°−0·3	°+0·3	°−0·4	
Malin Head	−0·4	−0·4	0·6	−0·7	−0·6	
Belmullet	−0·2	−0·1	−0·1	+0·1	—	No spare ther.
Donaghadee	−0·4	−0·5	−0·1	0·0	−0·1	
Parsonstown	−0·7	+0·1	−0·2	+0·1	—	Dry bulb (corrected) used as standard.
Valencia (Cahirciveen)	−0·3	−0·3	−0·2	+0·2	−0·1	No. 3580 do. do.
Roche's Point	−0·4	−0·4	0·0	+0·6	—	Dry bulb. do. do.
St. Ann's Head	−0·4	0·1	+0·9	+0·1	−0·1	

Stations.	Dry Bulb.	Wet Bulb.	Max.	Min.	Spare.	Remarks.
Weekly Weather Report Stations.						
Londonderry	−0·2	−0·2	0·0	+0·4	—	Max. ther. is new (bought in May).
Edenfel	—	—	+0·4	−0·3	—	
Waterford	−0·1	−0·1	0·0	+0·5	—	
Killarney	−0·4	−0·4	−0·3	−0·1	—	Dry bulb (corrected) used as standard.
Llandovery	—	—	−0·3	+0·5	—	Not graduated on stem.
Stations of the Second Order.						
Armagh	−0·3	−0·4	−1·7	—	−0·2	Grass min. + 1·1. Air min. therm. of Casella's mercurial pattern.
Brookeborough	−0·8	−0·7	−0·1	0·0	—	Grass min. − 1·0.
Dublin (City)	−0·6	−0·6	−1·0	0·0	—	Do. −0·6.
Dublin (Phœnix Park)	−0·4	−0·4	−0·4	+0·1	0·0	
Edgeworthstown	−0·5	−0·5	−0·3	+0·1	—	Do. +0·5.
Glasnevin	−0·3	−0·3	−0·1	+0·5	—	
Lissan	−0·2	−0·4	−0·8	+0·3	—	
Londonderry	−0·2	−0·2	0·0	+0·4	—	
Markree Castle	−0·4	−0·3	0·0	0·0	—	Dry bulb (corrected) used as standard.
Mount Nugent	−0·1	−0·1	+0·2	0·0	—	Do. do.
Parsonstown	−0·7	+0·1	−0·3	+0·1	—	
St. David's	−0·2	−0·3	0·0	+0·2	—	

(Signed) Robert H. Scott.

Report of Inspection of Scottish Stations for Year 1893.

Barometers.

The barometers at the stations were compared with inspector's standard No. 690, which continued to be in good order during the inspection, as shown by a comparison with a standard in Edinburgh at the commencement and again at the close of the inspections. I have to report that the whole of the barometers specified in Table I. are correct, allowance being made for known instrumental errors, are in good order, and are correctly observed.

Table I.

Stations.	Inspector's Standard No. 690 corrected.	Reporting Barometer uncorrected.	Check Barometer uncorrected.	Remarks.
	Inches.	Inches.	Inches.	
Ochtertyre	29·696	29·684	—	
Dundee	29·762	29·760	—	
Braemar	28·972	28·972	—	
Aberdeen	30·160	30·160	—	
Nairn	30·050	30·047	30·050	
Lairg	29·904	29·890	—	
Dunrobin	30·156	30·158	—	
Wick	29·960	29·956	30·022	Check barometer at lower level.
Deerness	29·476	29·460	—	
Stornoway	29·498	29·494	29·494	
Fort Augustus	30·113	30·106	—	
Fort William	29·393	29·936	—	
Laudale	30·414	30·416	30·410	Check barometer in flat above.
Callton Mor	30·074	30·040	—	
Rothesay	29·934	29·396	—	
Ardrossan	30·002	30·004	—	
Pinmore	29·935	29·934	—	
Edinburgh	28·757	28·730	—	
Leith	29·161	29·161	29·164	
Glasgow	29·619	29·619	—	
Cargen	29·690	29·650	—	

Thermometers.

The minimum thermometers were carefully examined with the result that all were found in good order with the exception of two. At Rothesay and Ardrossan about one degree of the spirit was lodged at the very top of the tubes, which in each instance was put right by the observer himself under my direction. In both cases the evaporated portion was not very easily seen. All the maximum thermometers were found in good order.

Table II.

Stations.	Standard Thermometer, No. 433	Dry Bulb.	Wet Bulb.	Spare Thermometer.	Max. Thermometer.	Min. Thermometer.	Time in Water in Minutes.	Change of Temperature.	Remarks.
	°	°	°	°	°	°	′	°	
Ochtertyre -	60·2	0·0	−0·1	—	0·0	−0·1	180	+0·4	Ther. on grass 0°·0.
Dundee -	58·2	−0·6	−0·6	—	+1·4	−0·3	80	+0·5	New hygrometer.
Braemar -	59·1	+0·3	+0·4	—	0·0	−0·2	140	Uniform	
Aberdeen -	61·2	+0·3	+0·3	—	+0·1	+0·3	90	Do.	
Nairn - -	64·0	+0·7	+0·8	—	0·0	−0·2	75	+0·5	
Lairg - -	65·4	+0·3	+0·2	—	−0·2	+0·1	100	Uniform	
Dunrobin -	64·0	−0·5	−0·5	—	0·0	−0·4	55	Do.	
Wick - -	60·8	+0·4	+0·5	—	0·0	0·0	90	Do.	
Deerness -	64·8	0·0	0·0	+0·2	−0·9	−0·2	70	+0·2	
Stornoway -	57·8	+0·5	+0·5	—	−0·6	−0·6	120	+0·2	
Fort Augustus	59·0	+0·1	+0·1	—	+0·2	−0·4	80	Uniform	
Fort William -	59·1	+0·1	+0·1	—	+0·2	0·0	120	Do.	
Do. Observatory -	59·1	—	—	—	0·0	−0·7	120	Do.	
Laudale - -	58·1	+0·2	+0·2	—	+0·1	+0·2	100	Do.	
Callton Mor -	64·2	+0·1	0·0	—	+0·8	−0·4	85	+0·2	
Rothesay -	59·9	+0·1	+0·1	—	+0·1	−0·1	80	+0·3	
Ardrossan -	60·1	+0·2	+0·2	—	−0·2	−0·2	110	Uniform	
Pinmore -	60·0	0·0	−0·1	—	−0·2	0·0	95	Do.	
Edinburgh -	52·2	+0·1	0·0	—	0·0	−0·1	90	Do.	
Leith - -	52·8	0·0	+0·1	—	−0·1	−0·5	60	+0·2	
Glasgow -	48·3	—	—	—	−0·1	−0·1	100	−0·4	Ther. on grass −0°·2.
Cargen -	52·7	−0·1	−0·1	—	0·0	−0·2	135	+0·3	

Hygrometers.

The dry and wet bulbs at all the stations were read directly on opening the thermometer screens and the readings compared with the apparent hygrometric conditions at the time, and I am thereby led to report very favourably as to the care with which these observations are everywhere made. At Dundee the hygrometer had been accidentally broken and replaced by one purchased in the town. The errors of the new dry and wet bulbs were ascertained.

Notes of Inspection of the Stations

Ochtertyre, July 25th, 1893.—Everything at this station is in excellent order, and the observer is enthusiastic and accurate.

Dundee, August 17th.—The instruments are in good order and the observations were made carefully and correctly by the assistant who was temporarily in charge. A new hygrometer had recently been procured to replace the old one which had been accidentally broken. Mr John Carnochan was appointed curator of the cemeteries after the death of

Mr. McKelvie, who was so long in charge of this station. Mr. C. evinces much interest in the observations and is desirous of giving all assistance in his power.

Braemar, August 8th.—The instruments are in admirable order, and the observations are made by Mr. Aitken and his two assistants with care and correctness.

Aberdeen, August 9th.—Instruments and observations at this place are all that can be desired.

Nairn, August 12th.—The thermometer screen has just been repainted and repaired, and the instruments generally are in good order. I had some conversation with Miss Penny about the readings of the barometer, dwelling on the necessity there is for systematically checking the accuracy of each observation entered in the journal by a second observation.

Lairg, August 14th.—The instruments are all in excellent order, and the observations made with care and accuracy.

Dunrobin, August 15th.—The instruments continue to be kept in good order, and the observer is careful and attentive.

Wick, August 16th.—Mr. Sinclair has recently been rather seriously ill, and all the observations were consequently made by Miss S., who occasionally neglected to compare the barometer reading entered in the journal with a second observation. This is promised to be rectified. The instruments are in very good order, and Miss S. continues to manifest much interest in the observations.

Deerness, August 18th.—The instruments are all in admirable order, and the observations are made with much care and intelligence.

Stornoway, August 22nd.—The instruments are in good order, and the observations appear to be made with care. The omission recently to enter in the daily telegram a barometric fluctuation shown by the barograph was pointed out, and the necessity of attending to the notification of these fluctuations in future. Considerable additions have been made to the school buildings, and other changes and additions to the present grounds are in contemplation. Meanwhile, instruments remain in their present position till a decision is come to, when they will be shifted to the positions I pointed out in accordance with the decision arrived at.

Fort Augustus, August 25th.—On examination the sunshine recorder was found slightly out of focus, and directions were given as to putting it right, otherwise the instruments are in excellent order, and the observations are made with special care and intelligence by Father Martin, who has resumed the charge of the station.

Fort William, August 25–28th.—A new maximum thermometer was added in November to replace one which had been accidentally broken. The sunshine recorder was removed to its new position September 1st, 1892, where it will remain permanently. Mr. Omond has, during the past two years, empirically determined the varying number of hours of actual sunshine during the days of the year, as these are reduced by the surrounding hills. The results are given in the following Table :—

TIMES OF HOURS SUNSHINE.

	Theoretic.	Observed.	Difference.
January - - -	231	151	80
February - - -	275	193	82
March - - -	365	295	70
April - - - -	426	357	69
May - - - -	508	413	95
June - - - -	529	438	91
July - - - -	528	429	99
August - - -	467	380	87
September - - -	381	315	66
October - - -	319	241	78
November - - -	242	167	75
December - - -	210	125	85
Year - -	4,481	3,497	984

The standard barometer was shifted from the south-west to the north-west wall of the instrument room in July, both positions being at the same height. The instruments are in excellent order, and the observations are punctually and accurately made.

Laudale, August 29th.—The instruments are in remarkably good condition, and the observations are made carefully and correctly. Hitherto the observer has been occasionally revising his observations on a faulty method, which in future is not to be practised.

Callton Mor, August 30th.—The instruments are well kept, and the observations made with great care by Mr. Russell and his assistant.

Rothesay, August 31st.—About a degree of spirit was lodged at top of tube of the minimum thermometer, in a position not readily seen. It was put right by the observer under my direction; otherwise the instruments were in good order and the observations made very accurately.

Ardrossan, August 31st.—The rain-gauge has just been thoroughly repaired, and the Stevenson screen was ordered to be repaired and repainted. About one degree of spirit was lodged at the top of the tube of minimum thermometer. It was put right by the observer under my direction. I have pleasure in reporting that matters at this station are now in a satisfactory state.

Pinmore, September 1st.—The instruments are all in very good order, and the observations made with care and intelligence.

Edinburgh, October 4th.—The sunshine recorder, which was very slightly out of order, was put right. The other instruments were in remarkably good order, and great zeal and intelligence is manifested in conducting the work of the station.

Leith, October 5th.—The rain-gauge and the railing inclosing the instruments were put in a state of thorough repair shortly after last year's inspecton. Everything is in good order, and care and intelligence are shown on the part of the observer and two assistants in making the observations.

Glasgow, October 9th.—Professor Becker, who has succeeded Professor Grant, evinces the greatest interest in the meteorological department of the observatory. The instruments are in remarkably good order, and the work of observing is well attended to.

It is necessary to remove the anemometer from its present position, where it has been since 1868, but it is not yet decided where to place it.

Cargen, October 10th.—A new barometer has been added, to replace the one that has been accidentally broken. The thermometer screen had recently been repainted, and everything about the station is in excellent order, and the observations are well attended to.

(Signed) ALEXANDER BUCHAN.

REPORT of INSPECTION of the ENGLISH STATIONS, 1893.

I have the honour to submit the following Report of the Stations inspected by me in the year 1893:—

TELEGRAPHIC REPORTING STATIONS.

Spurn Head, inspected on April 21st.—All the instruments at this station were in good order, and appeared to be carefully attended to. The dry-bulb, without corrections, occasionally exceeds the maximum.

York, April 22nd.—I think that there is some improvement in the observations at this station, and that they are more punctually taken. There is no other change.

Prawle Point, inspected August 20th.—All the instruments were as usual in good order. The assistant, Mr. Fenton, was absent on the day of my visit.

Scilly, inspected August 22nd.—The observer read the barometers a little low. The hygrometer was rather foul.

Jersey, September 2nd and 3rd.—The observer had been obliged to relinquish his office as railway station master at St. Aubins, and the barometers had been moved to his own house, without however, any appreciable change of altitude above mean sea level. The instruments were in good order. I examined some other sites for both the outdoor and indoor instruments, some remarks about which I supplied to the Meteorological Office in the prospect of Mr. Fisher's having to resign the work of observation.

Hurst Castle, September 6th.—The instruments were all in good condition. Errors have occasionally been made in the readings of the barometers. The remarks made by me in previous reports as to this station remain applicable. I have since learned that Mr. Appleton is about to retire.

Yarmouth, October 24th.—The instruments were all in good order as usual.

Cambridge, October 26th.—The instruments were in fair order, and the new observer seems to me accurate and careful. Wind forces are, as it appears to me, estimated at higher figures since the resignation of Mr. Todd.

Loughborough, October 28th.—Much care is still taken by the observer at this excellent station.

North Shields, November 1st.—Mr. Irvine was absent. I have now no fault to find with the observations at this station, and the barometers were correctly read.

Liverpool, November 7th.—Both Mr. Plummer and Mr. Skinner were absent. The instruments appeared to be in fairly good order. The thermometer corrections seemed to be nearly in accordance with those previously determined by me.

Dungeness, December 22nd.—All the instruments were clean and in good order; and I have no fault to find with the station, except that the observers set the verniers a little too low.

North Foreland, December 27th.—The observer was absent. I called, however, at his lodgings and suspended my standard by the side of the barometer which is there kept, with the conclusion that the latter does not read quite correctly. There is no air in either of the barometer tubes at this station. The thread of spirit in the minimum I found to be broken in several places, and the deputy observer informed me that it was frequently in this condition. A new minimum is, I think, required. All the other instruments were in excellent order.

Second Order Stations.

York, April 22nd.—There is no alteration of any importance at this station. The thermometers, as I have before reported, are in my opinion too crowded.

Plymouth, August 21st.—The barometer was about to be moved to the observer's new house. This promises to be a good station.

Southampton, September 1st.—All the instruments at this station were, as usual, in good order, and appear to be carefully attended to.

Geldeston, October 25th.—Mr. Dowson was absent at the time of my visit. All the instruments were, as usual, in excellent order. The wet-bulb, however, read somewhat high.

Uppingham, October 27th.—The observations are excellently taken. Some of the old thermometer corrections seemed to need alteration, as will be observed from the table.

Durham, November 1st.—The instruments were in very fair condition. Mr. Carpenter is a careful and efficient observer.

Aysgarth, November 3rd.—This station continues to be excellent. The observer has at times been absent. The minimum seems to require a large correction, and is not a very good instrument.

Prestwich, November 5th.—Dr. Clunn, who kindly read the instruments with me, failed to read them quite correctly in water, being very myopic. The deputy overseer only arrived just before I had to leave.

Liverpool, November 7th.—The instruments were in fairly good order, but the wet-bulb a little foul. The observers were absent.

Cronkbourne, November 8th.—Both Mr. Moore and his assistant were absent from the Isle of Man. I found everything in good order at this well-maintained station.

St. Leonard's, December 23rd.—The observations are, in my opinion, very ill-attended to. The wet-bulb was dry and excessively dirty. Doctor Colborne was absent. He has again changed his residence. I was shown the barometer, but was unable to open the case.

Eastbourne, December 23rd.—I found all the instruments in excellent condition and well attended to. The corrections applicable to the thermometers are trivial, and practically unaltered. No interference with the rain-gauge has lately been noticed. The observations are likely to be permanent.

SECOND ORDER STATIONS whose RETURNS are not fully published.

Tealby, October 30th.—The observer has been seriously ill, and I have fears that the station will not be kept up permanently. The instruments were all in good order.

Seaham, November 1st.—Mr. Aird had been taken ill on the morning of my visit. The instruments at the Cemetery grounds were in good order and well attended to; and the hygrometer was no longer dirty. The returns seem to me to be in themselves, as regards condition, worthy of publication, though errors are not infrequent. The proximity of the station to Durham renders, however, these returns of comparatively little value. The station has been continued for a long time, and promises to be permanent.

Manchester, November 5th.—Doctor Tatham was absent. I do not think that his new appointment can lead to any discontinuance of the observations; and I hope that they may be taken in the evening as well as in the morning. The instruments were in good order, and the deputy observer takes great care.

St. Helen's, November 7th.—No returns have yet been sent in. I strongly urged that the work should be begun. The instruments were all in fair order, and I see no sufficient reason why the station should not be a good one.

SELF-RECORDING OBSERVATORIES.

Stonyhurst, November 6th.—The returns from this observatory show gradual but satisfactory improvement, although errors are still not uncommon. The computer read the barometer rather low. The corrections needed for the self-recording thermometers seem trivial.

NEW STATIONS.

Normanhurst (*Matlock*), October 28–29th.—Mr. Smedley informed me that the barometer had been broken and sent back to London. The outdoor instruments are good, but no evening observations are at present taken. The exposure is all that could be desired.

Heysham Hall (*Morecambe*), November 4th.—This new station promises well. The instruments were all in good order. The deputy observer, Mr. S. Lomas, at first read the barometer wrongly; he is intelligent and careful, but unequal at present to hygrometrical reductions. The thermometer screen, made by a Lancaster workman, is, I think, rather too near a greenhouse on the north side of a large vegetable garden. The barometer, a good instrument, is in the house of Mr. Lomas, 10 feet below the outdoor instruments.

Weekly Weather Report Stations.

Besides those of the above stations which send weekly weather reports, I visited *Arlington Court* on August 24th. The observer has been changed since my last visit; and the instruments did not appear to be quite so well attended to, more especially the hygrometer.

Bristol, August 26th.—The observer, J. H. Jones, Esq., F.R.A.S., has regarded the maximum temperatures registered by him as abnormally high. I hesitate to adopt this opinion. All the instruments were in very fair order, and the station promises to be a useful one.

Cirencester, August 28th.—The sunshine recorder is not fixed to the stand, and is evidently, experimentally or accidentally, moved from time to time. Professor Ohm was absent at the date of my visit. The thermometers were in excellent order.

Hesley Hall (*Bawtry*), October 31st.—All the instruments were, as usual, in satisfactory order, and the returns appear to be carefully made.

Alnwick Castle, November 2nd.—The garden instruments are good. The thermometers in the library window are, as I was informed, "corrected by those kept in the gardens." But the latter are not well attended to; and the head gardener is frequently changed. The hygrometer was in a very unsatisfactory condition.

Rainfall Stations.

I visited *Poulton* (*Fairford*) on August 28th.—The station is not ill situated. The gauge is fairly exposed, but stands rather too high above the ground. I spent a long time in giving instructions to the observer who is not well educated.

Market Rasen, October 30th.—There is no alteration at this station. The instrument was in good order, and Mr. Jevons continued to take the readings carefully.

Instruments Employed.

I again employed Adie 590 as a standard barometer at the few stations to which I took a mercurial barometer. One of my two standard thermometers was broken by some passenger who meddled with my instrument case in crossing to Scilly, and I have since employed in its stead Negretti and Zambra's 5077.

Name of Station.	Barometer.	Thermometer.									Name of Station.
			Dry Bulb.	Wet Bulb.			Maximum.	Minimum.	Spare on Grass.		
	Difference of Observers' from Inspector's Readings.	Temperature of Water.	Correction to reduce to Inspector's Standards.	Correction to reduce to Inspector's Standards.	Difference of Wet from Dry Bulb.	State of Hygrometer.	Correction to reduce to Inspector's Standards.	Correction to reduce to Inspector's Standards.	Correction to reduce to Inspector's Standards.	General Condition.	
		°	°	°	°		°	°	°		
Alnwick Castle -	—	47	+0·8	+1·2	−0·4	C	−3·0	−2·0	—	C	Alnwick Castle.
Arlington Court -	—	61	−0·4	−0·5	+0·1	C	−0·4	−0·1	—	C	Arlington Court.
Aysgarth - -	·000	52	−0·1	−0·7	+0·6	A	−0·3	−1·2	—	A	Aysgarth.
Bristol - -	—	62	−0·4	−0·4	0·0	A	−0·1	−0·3	−0·2	A	Bristol.
Cambridge - -	−·001	51	−0·6	−0·5	−0·1	A	−0·9	+0·1	—	A	*Cambridge.*
Cirencester - -	—	61	−0·1	−0·2	+0·1	A	−0·1	−0·1	0·0	A	Cirencester.
Cronkbourne - -	−·002	40	−0·4	−0·3	−0·1	A	0·0	+0·2	−0·1	A	Cronkbourne.
Dungeness - -	−·003	45	−0·1	0·0	−0·1	A	0·0	−0·2	—	A	*Dungeness.*
Durham - -	−·001	46	−0·4	−0·4	0·0	A	−0·2	+0·4	—	A	Durham.
Eastbourne - -	—	46	0·0	−0·2	+0·2	A	−0·2	0·0	—	A	Eastbourne.
Geldeston - -	−·001	51	−0·3	−0·6	+0·3	A	−0·1	−0·1	—	A	Geldeston.
Hesley Hall (Bawtry)	—	51	−0·6	−0·1	−0·5	A	−0·2	−0·1	—	A	Hesley Hall (Bawtry).
Heysham Hall -	−·009	51	−0·3	−0·1	−0·2	A	−0·1	+0·2	—	A	Heysham Hall.
Hurst Castle - -	−·003	61	−0·8	−0·2	−0·6	A	−0·8	−0·1	—	A	*Hurst Castle.*
Jersey - -	−·002	62	−0·2	−0·5	+0·3	A	+0·4	+0·1	—	A	*Jersey.*
Liverpool - -	—	44	−0·1	0·0	−0·1	B	−0·2	+0·2	—	B	*Liverpool.*
Liverpool - -	—	44	−0·1	0·0	−0·1	B	−0·1	+0·2	—	B	Liverpool.
Loughborough -	−·001	52	−0·4	−0·4	0·0	A	−0·4	−0·3	+0·3	A	*Loughborough.*
Manchester - -	−·001	47	0·0	−0·1	+0·1	A	+0·4	+0·1	—	A	Manchester.
Matlock - -	—	51	−0·1	0·0	−0·1	A	+0·2	−0·2	—	A	Matlock.
North Foreland -	+·004	43	−0·4	0·0	−0·4	A	−0·2	0·0	−0·2	A	*North Foreland.*
North Shields -	−·002	53	−0·1	−0·1	0·0	B	−0·1	+0·1	—	A	*North Shields.*

Name of Station	Barometer. Difference of Observers' from Inspector's Readings.	Thermometer. Temperature of Water.	Dry Bulb. Correction to reduce to Inspector's Standards.	Wet Bulb. Correction to reduce to Inspector's Standards.	Difference of Wet from Dry Bulb.	State of Hygrometer.	Maximum. Correction to reduce to Inspector's Standards.	Minimum. Correction to reduce to Inspector's Standards.	Spare on Grass. Correction to reduce to Inspector's Standards.	General Condition.	Name of Station.
Plymouth	−·001	66°	−0°·3	−0°·6	+0°·5	A	0°·0	+0°·3	−0°·1	A	Plymouth.
Prawle Point	·000	67	−0·2	−0·7	+0·5	A	−0·1	−0·2	0·0	A	*Prawle Point.*
Prestwich	—	48	−0·5	−0·1	−0·4	A	−0·2	+0·3	−0·2	A	Prestwich.
St. Helen's	+·002	50	−0·2	−0·2	0·0	A	−0·3	+0·1	—	A	St. Helen's.
St. Leonard's	—	50	−0·7	−0·9	+0·2	C	0·0	+0·1	—	C	St Leonard's.
Scilly	−·002	65	−0·7	−0·6	−0·1	B	−0·5	−0·3	—	B	*Scilly.*
Seaham	+·002	40	−0·6	−0·4	−0·2	A	−0·1	−0·3	—	A	Seaham.
Southampton	−·001	63	−0·2	−0·2	0·0	A	−0·2	−0·2	−0·1	A	Southampton.
Spurn Head	·000	48	−0·7	−0·4	−0·3	A	0·0	0·0	—	A	*Spurn Head.*
Stonyhurst	−·004	—	−0·1	−0·3	+0·2	A	0·0	+0·1	—	B	Stonyhurst.
Tealby	−·001	45	−0·4	−0·2	−0·2	A	−0·6	+0·4	−0·1	A	Tealby.
Uppingham	·000	55	−0·3	0·0	−0·3	A	−0·5	−0·2	—	A	Uppingham.
Yarmouth	+·001	50	−0·1	−0·5	+0·4	A	−0·5	−0·1	—	A	*Yarmouth.*
York	·000	53	−0·7	−0·7	0·0	A	−0·1	0·0	—	A	*York.*
York	·000	53	−0·7	−0·7	0·0	A	−0·4	0·0	—	A	York.

(Signed) W. Clement Ley.

REPORTS on INSPECTIONS of OBSERVATORIES, &c.

To R. H. Scott, Esq., F.R.S.

DEAR SIR, Kew Observatory, October 27, 1893.

I BEG to submit the following report to the Meteorological Council concerning their self-recording instruments at the various observatories and anemograph stations, inspected on the days named :—

Yarmouth, August 16th–18th.—The anemometer at this station having been reported to be out of order, I was instructed to go down to Yarmouth as soon as arrangements could be made with Mr. Chree for me to leave the Observatory. Accordingly I left Kew on August 16th, and called upon Mr. Watson at the Sailors Home, who has charge of the anemograph.

After carefully examining the recording apparatus, I came to the conclusion that the irregularity in the trace shown on the sheet for August 10th was due to the clamping screw (which had become very much worn) not gripping the spindle of the cylinder with sufficient force, so that the pressure of the pencils, combined with a shift in the direction of the wind, no doubt caused the cylinder to slip back from time to time. This I had put right by a local clockmaker, and then dismounted the external parts of the anemometer (which had been well attended to in oiling), and, after cleaning and examining the orientation, the instrument was started on the 17th, and the curve taken off on the following morning showed that the defect had been remedied.

Glasgow, August 31st to September 2nd.—The wet-bulb standard thermometer No. 709 having been accidentally broken at this observatory, another standard, No. 711, was ordered to be taken down from Kew to replace it. This I did, and fitted up the new one in the thermograph screen, after making some slight alterations in the metal mounting.

There is one spare thermograph tube at the observatory for use in case of breakage, but no scales have yet been constructed for tabulating the photographic curves derived from the new dry and wet tubes which were fitted up by me in April 1892.

When examining the thermograph clock and lenses, I improved the definition of the zero-lines, and also rectified the action of the light stop, which had failed to cut off the light from time to time.

The barograph clock was oiled and the instrument generally attended to, and the vent-hole in the cistern was found to be quite free.

The external parts of the anemometer were dismounted and cleaned, and all the bearings lubricated with fresh oil. After examining the clock and recording apparatus, the orientation was duly tested, and the observer instructed to prepare, and send in each month, an orientation paper.

As requested, I examined some of the anemograph and rain-gauge tracings. The former tracings were found to be exact copies of the originals, but the latter were not, inasmuch as the assistant had carried the trace down to the full extent of the scale and fully up to the zero-line, as will be seen by the tracings accompanying this report (not reproduced here).

This appears to have always been done, but I requested Mr. Connell to send in for the future facsimiles of the curves. After oiling and cleaning the friction rollers of the rain-gauge, I found by experiment that the pencil, when lighly pressing against the paper, descended to the full extent of the scale, although it did not return again to the zero line but this gauge is *not provided* with a Stonyhurst discharger.

The various thermometers were compared with the Kew standard thermometer No. 682 at 55 degrees, and their corrections found as follows :—

Dry standard 708 - - - -	−0°·1
Wet „ 711 - - - -	+0·1
Maximum 58846 - - - -	+0·1
Minimum 63942 - - - -	−0·1
„ (for grass) 59003 - - -	−0·1
Standard barometer - } No. K.O. 2479 -	−0·5
Attached thermometer }	
Barograph thermometer (no number) - -	−0·8

The Mason's hygrometer, which was used in the screen, temporarily, in place of the broken thermometer, was also examined :—

Dry bulb, 2847 - - - - -	−0·5
Wet „ - - - - -	−0·5

Aberdeen, September 4th–6th.—The two new thermograph tubes ordered to be sent down to this observatory from Kew were safely conveyed by me, and on September 4th No. 1 was fitted up to replace the broken wet bulb tube, whilst the other (No. 3) was carefully put away for future use when required. The curves developed on the following morning showed that the new tube had been successfully adjusted, and that the records were satisfactory.

To obviate any further danger of breakage, Mr. Boswell placed a small piece of zinc over the hole in the wall at the back of the screen to prevent any stray bird from resting there.

Although the barograph and thermograph were going well, the clocks required cleaning as well as the lenses. These operations were duly carried out, and the thermometers were compared in pounded ice, with the following results :—

Dry bulb 397, read - -	32°·1	correction −0°·1
Wet „ 395, read - -	32·6	„ −0·6
Maximum 1002, read - -	32·0	„ 0·0
Minimum 5056, read - -	31·9	„ +0·1
Attached thermometer (to standard barometer) 71061, read - - - -	32·2	„ −0·2
Barograph thermometer (no number) - - -	34·0	„ −2·0

The anemometer was dismounted and all parts cleaned, the different bearings being afterwards replenished with sperm oil. The orientation was examined, and squeezes taken of both the spare and self-recording rain-gauges after the latter had been examined and the various parts cleaned and oiled.

Deerness, Orkney, September 8th–9th.—At this station the anemograph was inspected on September 8th, but through a misunderstanding as to the exact date of my visit Mr. Spence was absent.

I had the exterior parts entirely dismounted, and found that the various bearings were all well oiled, and the instrument had been care-

fully looked after. The curve taken off the cylinder on the morning of my visit was not altogether satisfactory, but this, I think, was owing to the assistant not having clamped the clock sufficiently tightly to the cylinder when starting the instrument on the previous day.

The clock was taken to pieces and cleaned, the recording apparatus oiled, and afterwards the orientation was examined and found correct.

On the following morning I drove over again from Kirkwall and found that the anemometer had gone all right, and Mr. Spence, who had returned home that day, called my attention to a slight defect in the direction-pencil, but unfortunately I had no emery buff with me to correct it. Since my return, however, I have sent out two emery buffs to Mr. Spence, in case the end of the pencil still requires to be slightly rubbed down.

The observer was instructed to adjust the sheet upon the cylinder so as to make the traces fit the printed forms.

The sun recorder was in good order.

Fort William, September 13th–15th.—The clocks of both the barograph and thermograph were taken to pieces and cleaned. The lenses, condensers, and mirrors received the usual attention, and the zero dots were changed to the winter position. The intensity of the photographic traces was also much improved after the mirrors, &c., had been cleaned.

The thermometers were compared with the Kew standard No. 682, and found to have the following corrections at 60 degrees:—

Dry bulb 671 - - - - -	0°·0
Wet „ 672 - - - - -	−0·2
Barograph thermometer, K.O. 6–90 - - -	−2·2
Standard barometer, attached thermometer No. 72222	−0·1
Maximum 1092 - - - - -	+0·1
Minimum 1322 - - - - -	+0·7

Note.—As the minimum thermometer was reading low, I dismounted it from the scale and slightly heated the chamber end over a lamp and after standing the tube in a vertical position for some three hours, the following correction was found:—

Minimum 1322 - - -	+0·3

My special attention having been directed to the unsatisfactory action of the self-recording rain-gauge, I suggested to Mr. Omond the advisability of entirely dismounting the instrument and fitting it up temporarily in the observatory, as the weather at the time was stormy.

After cleaning the clock we again tested the capacity of the receiver which was found to agree with the original value given, of 0·18 inch.

Experiments were then made with the Stonyhurst discharger, when it was discovered that the float did not exert sufficient lifting power to push the pencil up to the zero line after a discharge of 0·18 inch. We found that the position of the float in the discharger was adjusted for a fall of 0·20 inch, so that the amount of rain (0 18) passing in from the receiver did not rise to a sufficiently high level.

As a ready way of getting over the difficulty we put a number of pebbles of suitable size into the bottom of the discharger, thereby raising the level of the water and the float was then found to act perfectly in forcing the pencil up to the zero-line.

As regards the difference shown between the trace and the amount measured in the glass, the former being less, I think that this was principally due to friction, as the instrument badly required cleaning. After filtering the mercury and cleaning the friction rollers, which had become somewhat sticky, the free action of the float carrying the pencil was considerably improved.

Alnwick, September 18th.—I visited Alnwick Castle on September 18th by appointment with H. J. Willyams, Esq., who has succeeded Colonel F. Holland in the service of His Grace the Duke of Northumberland. Through the kind courtesy of Mr. Willyams, every facility was afforded me for examining the anemometer, though unfortunately the weather was unsettled and rainy at the time.

The anemometer is erected on one of the turrets on the roof of the Castle, and, by means of a considerable amount of shafting, is connected to the recording apparatus which is placed in the library.

The exterior parts of the instrument appeared to be well oiled, and are attended to from time to time by the resident mechanic. On examining the recording apparatus I found that the direction-pencil was a few points out of orientation, but after some little difficulty this was put right, and on testing the four principal points it registered satisfactorily.

The exposure of the anemometer is fairly good for all winds, excepting those coming from the N.N.W., N., and N.E. When the direction is in any of these quarters the flag-tower to the N.E., which is in close proximity to the instrument, causes eddies to sweep round the tower and turrets to such a degree that the direction-vane frequently makes a complete turn round the compass, so that the record is not of much value.

The observer's attention was called to the times of starting, and also to the desirability of more care being exercised in tracing the curves.

From an inspection of these it was evident that the clock lost considerably in the course of the day. I endeavoured to shorten the length of the pendulum, but was unable to do so as the bob had become firmly rusted in.

I suggested that this should be seen to by a local clockmaker.

North Shields, September 19th–20th.—The anemometer here was found working very well, and is in excellent order, neither the fans nor the cups showed any signs of wear. I entirely dismounted the instrument and had every part cleaned, and all the bearings lubricated with fresh sperm oil; afterwards the orientation was examined and found correct.

Fleetwood, September 22nd–23rd.—At this station the anemograph was in good working order, and, as usual, well attended to by Mr. Gaulter.

On examining the direction fans I found that one of the blades had become unsoldered; this was put right before leaving. The cup-arms, and stays did not show any signs of wear.

The external portions of the instrument were thoroughly cleaned and oiled, as well as the clock and recording apparatus. Afterwards the orientation was duly examined and found correct.

Stonyhurst, September 25th–26th.—Here I found the photographic instruments in good order, but had the thermograph clock dismounted and cleaned and attached a new line to the barrel; also the barograph was examined and the usual cleaning of lenses, &c. performed.

The zero-lines of the thermograph were shifted to the winter position and the intensity of the dots of light improved.

Afterwards the various thermometers were compared by means of Kew standard 682 and found to have the following corrections at 52° Fahr.:—

Dry bulb 619 - - - -	—0·1°
Wet „ 382 - - - -	—0·4
Maximum 1525 - - -	0·0
Minimum 501 - - - -	+0·2

I also tested the maximum and minimum thermometers fitted up in the Glaisher stand and found the corrections to be

For Maximum 7310 - - -	—0.4
For Minimum 48587 - - -	0·0

The extreme temperature values supplied to the Registrar-General are derived from the readings of these latter instruments, and it is evident from this comparison that the large differences shown in April, May, and June, between the extreme readings as published in the Registrar-General's report and those published by the Meteorological Council are not due to instrumental errors, but rather to the different exposures.

The Glaisher stand is erected on the lawn and is fully exposed to the sun's rays for the greater part of the day, so that the effects of radiation must be very considerable, whereas the thermograph screen is fixed to the north side of the observatory, and is almost entirely protected from the sun, and the readings sent to the Meteorological Office are derived from the thermometers placed in this screen.

The anemometer was dismounted and cleaned and the various bearings renewed with fresh oil. The observer was instructed to send up an orientation sheet once a month, and his attention was called to the entry of the times of changing the papers. The defect in the recording-pencils noted from time to time in marking, I think, must be due to an irregularity in the surface of the cylinder, though Father Sidgreaves rather inclines to the belief that the pencils are faulty.

After cleaning and oiling the recording parts, I put a fresh sheet on the cylinder, lowered the pencils, and slowly revolved the drum by hand through the 24 hours, this was repeated some 14 times, taking care to have a fresh position at starting, and from an inspection of the experimental sheet marked A there is a general tendency of the pencil failing to mark during the midnight hours. If the records are still defective I would respectfully suggest that the cylinder and pencils be dismounted and sent to the makers, who could readily examine the cylinder in a lathe.

As regards the rain gauge pencil failing to rise to the zero line, this is mainly due to the fact that the discharger is nearly worn out. It was the first one made, and was only roughly put together at the College. It has now been in use over 20 years and is practically worn out, I would therefore recommend that a new one be supplied.

Holyhead, September 28th–29th.—At the date of my visit here the weather was very stormy, a strong westerly gale having set in with heavy rain, but fortunately Mr. Cotton had re-erected the anemometer (which had been under repair) on the previous afternoon, and the curve which came off on the morning of the 28th appeared fairly satisfactory.

Notwithstanding the high wind, I managed to examine the exterior parts of the instrument, and found that the bearings were all well oiled, but the direction-fans were working rather stiffly; this was owing to

the bearings being screwed up too tightly. The interior recording parts were cleaned and the orientation was tested and found correct, and the observer instructed to make a mark with the pricker at the time of starting.

(Signed) T. W. Baker.

Report on Inspection of the Observatories at Falmouth and Oxford, 1893.

Falmouth Observatory, visited August 14th–17th.—All the instruments were found in very fair condition and well attended to.

The anemograph has been kept well oiled wherever it was possible to do so without disturbing the instrument, but on dismounting the exterior portion, the oil in platform containing the direction roller bearings was found almost dried up, and what little was left had thickened. This was all removed, and, after thorough cleaning, filled up with fresh asbestoline.

The clock and recording parts were also examined and cleaned, and the orientation tested by local marks and by compass bearings.

The endless screw of the direction-spindle begins to show marked signs of wear, and will eventually require renewal.

The check-piece fitted to the rain-gauge, to prevent the pencil rising beyond zero-line of curve paper, was found to have worked loose; this was made rigid.

The cylinder platform was noticed to be revolving dangerously close to the "stop"; the latter was bevelled off to allow more room.

The pencil used—which gives good traces—is a Wolff's "Spanish Graphite," carefully pointed each time the curve is changed, and the least necessary pressure used to cause it to record clearly.

Mr. Kitto pointed out that the screw fixing this pencil in its holder was quite worn out. A new one was procured locally, and fitted to holder next day.

Examination showed that some of the wooden stakes used to secure the "check" rain-gauge had decayed, rendering the instrument liable to move in high winds. Fresh supports were driven in, gauge made firm and carefully levelled, and a "squeeze" taken of rim of funnel.

The instrumental portions of the barograph and thermograph were in good order, but the escapements of both clocks required cleaning, which was done. Some difficulty having recently been experienced in altering the length of the barograph pendulum, I examined same, and found that the thread taking-into-rating nut was rusted; after soaking it in oil for some time this was remedied.

The dial divisions on both these clocks are becoming very difficult to read, and fresh enamelled dials would be a great improvement.

The bulbs of the thermometers are 3 feet 4 inches above the ground.

The thermometers were all compared with my standard at a temperature of 65°, and the following corrections determined:—

Dry,	No. 383	=	$-0^{\circ}\cdot5$
Wet,	„ 388	=	$-0\cdot3$
Maximum,	„ 104	=	$-0\cdot4$
Minimum,	„ 308	=	$-0\cdot1$

Height of barometer above sea level = 183 feet.
„ rain-gauge „ „ = 169 „
„ anemograph cup „ = about 210 feet.

Radcliffe Observatory, Oxford, visited August 30th.—Mr. Stone was absent, but his chief assistant, Mr. Wickham, courteously rendered every assistance.

All the instruments were found in good order and working satisfactorily.

I examined the clocks, &c., and oiled the escapements.

It having been rather difficult to read the thermometer attached to the standard barometer at low temperatures, it was with some trouble and risk removed, and then raised in its shield-tube, so as to bring the scale divisions, at about 32°, better into view.

I made a comparison with my standard of the various thermometers in use, and the following corrections were given :—

Dry-bulb standard,	No. 576	(in thermograph screen)	-	=	−0·1
Wet „	„ 575	„ „	-	=	−0·2
Dry thermometer	B.T. 1710	(in Stevenson's screen)	-	=	−0·3
Wet „	B.T. 1709	„ „	-	=	−0·3
Maximum „	M.O. 356	„ „	-	=	−0·3
Minimum „	M.O. 363	„ „	-	=	+0·1

(Signed) E. G. Constable.

Kew Observatory,
October 1893.

APPENDIX VI.

Method of Dealing with Telegraphic Weather Intelligence.

The operations connected with the preparation and issue of the Forecasts and Storm Warnings have not undergone any material change. Full details will be found in Appendix X. to the Report for 1891.

Daily Weather Report.

An important change has been made during the past year in the Daily Weather Report, as two telegrams are now received daily from P. Delgada, in the Azores, forwarded by the courtesy of the Portuguese Meteorological Authorities. The service is at present too new for any detailed report as to its value to be submitted. A detailed description of the Report is given in the Annual Report for 1887, and subsequent alterations have been noticed in the more recent Reports. The Report fills four large quarto pages as before.

The standing portions (maps, &c.) are printed in blue, while the information for each day is in black.

The subscription for the Report is—

For delivery by hand, where feasible, £2 *per annum;*
„ *by book post* £1 „

MS. copies of the observations and remarks can be supplied at the rate of 2*l.* 10*s.* per annum. Arrangements can also be made for the supply of charts drawn from the 8h. a.m. or 6h. p.m. observations, such as appear in the "Times."

The Office receives, when the telegraphic communications are perfect, fifty-eight reports each morning, seventeen each afternoon (except on Sundays), and twenty-nine each evening, the arrangement of which is explained in the Annual Reports for recent years.

The Monthly "Correction and Addition List" is published as before.

Weekly Weather Report.

The Weekly Weather Report, which has appeared since February 1878, and was re-arranged at the commencement of 1890, is prepared for the calendar week, Sunday to Saturday. It is published regularly on Thursdays and is illustrated by three maps for each day. These, like the Daily Reports, show the outline of the land and sea in blue, while the information on them is in black. The maps show (1) for 8 a.m., the temperature, weather, and sea disturbance; and (2) for 8 a.m. and 6 p.m., the distribution of pressure and the winds, over, and on the coasts of, Europe. The information on the first and second pages of each report has been increased, and consists of observations of Temperature and Rainfall made at 79 stations, the individual values for which are given on the second page of the Report, and of Sunshine records taken at 47 stations.

Tables of *Accumulated Temperature*, designed to give persons engaged in agriculture better means of estimating the manner in which vegetation is affected by temperature than that afforded by the more usual methods of treating the readings of the thermometer, are published on the first and second pages, and show for each week, and for the whole period from the beginning of the year, the weekly and progressive values respectively, of the combined amount and duration of the excess or defect of the air temperature, above or below a suitably fixed standard, or *base temperature*. The base value adopted is 42° Fahr.

Accumulated Temperature is expressed in *Day-degrees;* a Day-degree signifying 1° F. of excess or defect of temperature above or below 42° F. continued for 24 hours, or any other number of degrees for an inversely proportional number of hours. An explanation of the rules by which it is obtained will be found in the Annual Report for 1889, while full details as to the facts on which the rules are founded are published in Appendix II. to the Quarterly Weather Report for 1878.

In addition to the reports from the Telegraphic Reporting Stations, and the returns from the self-recording Observatories, weekly schedules from 56 volunteer observers are used, the names of the stations and observers being given in App. XI., p. 64.

The MS. of the report is prepared on Tuesday in every week, and the summary on its first page is sent to several papers on that evening; the printed copies of the complete report are ready for sale on Thursday afternoon.

Appendices, &c.

Two Appendices, I. and II., have appeared, similar to those for recent years. The Monthly Summary Supplement has been improved by the addition to its Tables of Columns showing the difference between the Pressure, Temperature, Rainfall, and Bright Sunshine of the current month, and the means for the corresponding months in a long series of years.

Issue of Forecasts.

There has been an important change in this work, the Board of Agriculture having forwarded the 3.30 p.m. daily forecasts to the rural parts of Northumberland and Essex, p. 12.

Remarks on the actual state of the weather, and forecasts *for not more than one day in advance*, are prepared at the Meteorological Office as under:—

*On Week Days.**

(1.) At 11 a.m. (from the morning reports), for the 24 hours ending at Noon on the day following the date of issue. These are intended especially for the early editions of the evening papers, for the clubs, and for exhibition at certain selected stations. See page 10.

(2.) At 3.30 p.m. (from the morning and afternoon reports), for the day following that of issue. This set of forecasts is not intended for publication in newspapers, but a copy is exhibited regularly at the door of the Meteorological Office, and during the Hay Harvest they are telegraphed to about 28 well-known agriculturists, to be made known in their neighbourhoods, see p. 11, and to the Board of Agriculture for transmission to certain counties in England (see p. 12).

(3.) At 8.30 p.m. (from the 8 a.m., 2 p.m., and 6 p.m. reports), for the day following that of issue. These are supplied gratis to any newspaper or news agency which may apply for them, and send for them regularly. A very large number of the more important papers and news agencies avail themselves of this advantage.

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* Good Friday and Christmas Day are reckoned as Sundays.

The forecasts are made for the following districts :—

0. Scotland, North.
1. Scotland, East.
2. England, N.E.
3. England, East.
4. Midland Counties.
5. England, South.
6. Scotland, West (with Isle of Man).
7. England, N.W. (with North Wales).
8. England, S.W. (with South Wales).
9. Ireland, North.
10. Ireland, South.

The remarks and forecasts are posted at the doors of the Meteorological Office, 63, Victoria Street, S.W., on week days,* for the inspection of the public. Copies, or extracts from them, are communicated under the conditions stated below, but no information which is not substantially included in them can be supplied.

A series of boards is exhibited on the front of the Office showing in large type the state of the wind, weather, and sea disturbance at six stations, situated on our S.E., S., and W. coasts. The stations selected are Yarmouth, Dungeness, The Needles, Scilly, Holyhead, and Valencia Island, and the observations posted up are those for 8 a.m. and 2 p.m. daily, except on Sundays,* the boards being changed at about 9h. 45m. a.m. and 3h. 30m. p.m. The information can be easily read from the street.

Forecasts for Subscribers.—Any person can be supplied with a copy of the 11 a.m. Forecasts, once on each week day,* on payment of a subscription of ten shillings per annum, or 2*s.* 6*d.* per official quarter, or any part thereof, *in addition to the cost of transmission ;* the charges will therefore be, by *letter* post, 9*s.*, by *book* post, 5*s.* 9*d.*, per quarter.

The forecasts for any of the districts and for any of the hours mentioned above can be forwarded by telegraph daily, on payment of 3*d.* per day for any definite period, in addition to the cost of telegraphy.

Forecasts for Clubs.—These are drawn up at 11 a.m., for all the districts, and are supplied to Clubs, for a subscription of ten shillings per annum. They are delivered by hand to Clubs situated in or near Pall Mall. Special arrangements can be made for delivery at a greater distance by hand or by post.

Forecasts for Hay and Corn Harvests, or for Public Use.—Special facilities are offered for the transmission of Forecasts for these purposes, a nominal fee of 2*s.* 6*d.* being charged for an official quarter or any part thereof, in addition to the cost of the telegrams.

Exhibition of Telegraphic Forecasts at Local Post Offices.—The Post Office has sanctioned the exhibition of Forecasts at Local Post Offices, provided space is available, if the persons to whom they are addressed desire them to be so exhibited instead of being delivered.

Unless otherwise arranged, all forecasts transmitted by post are sent by book post, not as letters.

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* Good Friday and Christmas Day are reckoned as Sundays.

Inquiries as to the Weather.

Inquiries Personally or by Messenger.—Any person applying at the Meteorological Office between 11 a.m. and 8 p.m. on week days, and between 7 p.m. and 8 p.m. on Sundays,* can be supplied, in writing, with the latest information in the possession of the Office and with the latest forecast issued for any specified district, on payment of one shilling for each inquiry.

Inquiries by Letter.—Application may be made by letter, enclosing thirteen pence in stamps if the reply is to be *by post*, and one shilling in stamps, in addition to the cost of the reply (consisting of ten words, exclusive of the address) if the reply is to be *by telegraph*.

Inquiries by Telegraph.—Any person may obtain *by telegraph* from the Meteorological Office the latest information as to the weather in any district of the United Kingdom by payment of a fee of 1*s*. in addition to the cost of a telegram and reply to any post office. The telegram containing the inquiry must be addressed as follows:

To

Weather,

London.

The payment for the reply should be for at least ten words in addition to the address.

Application may also be made for similar information to be sent either *by telegraph* or *post* on some future specified day.

Checking of Forecasts and Storm Warnings.

The forecasts and storm warnings issued by the Office are carefully checked by being compared with the conditions actually experienced during the time to which they refer. The method adopted was fully explained in the Annual Report for 1891, and the results for 1893 will be found on p. 14.

In order to render the information in the possession of the Office as to the weather experienced on our coasts still more complete, the Council have, as in preceding years, obtained from the various Lighthouse Boards the original log-books from some of the most exposed light-ships and lighthouses. They again express their cordial thanks for the co-operation so readily granted to them by these Boards.

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* Good Friday and Christmas Day are reckoned as Sundays.

APPENDIX VII.

REPORT ON THE COMPARISON OF THE FORECASTS ISSUED AT 8h. 30m. p.m. WITH THE WEATHER SUBSEQUENTLY EXPERIENCED, for the 12 Months, April 1893 to March 1894. The results are for the United Kingdom as a whole.

The letters used have the following signification :—

a = complete success. | **c** = partial failure.
b = partial (more than half) success. | **d** = total failure.

The checking has been conducted on the same system as that employed in previous years, *i.e.*, each forecast has been considered under the separate headings of "Wind" and "Weather," but the results of the 8.30 p.m. Forecasts only are here published.

The first column gives the per-centage of success in "Wind," the second in "Weather," and the third the average of the two.

The Summary for the various districts is given at page 10.

Months.		Per-centages.				Months.		Per-centages.			
		Wind.	Weather.	Average.	a + b.			Wind.	Weather.	Average.	a + b.
April	a	59	75	67	88	October	a	44	59	52	80
	b	23	18	21			b	28	28	28	
	c	13	4	8			c	18	8	13	
	d	5	3	4			d	10	5	7	
May	a	63	71	67	87	November	a	49	68	59	85
	b	24	15	20			b	30	23	26	
	c	8	9	8			c	13	8	11	
	d	5	5	5			d	8	1	4	
June	a	61	64	63	85	December	a	49	60	55	81
	b	24	21	22			b	24	28	26	
	c	10	11	11			c	22	6	14	
	d	5	4	4			d	5	6	5	
July	a	54	62	58	82	January	a	35	66	51	82
	b	25	23	24			b	36	27	31	
	c	13	12	13			c	19	4	12	
	d	8	3	5			d	10	3	6	
August	a	59	65	62	84	February	a	52	67	60	84
	b	24	20	22			b	24	25	24	
	c	12	9	11			c	18	6	12	
	d	5	6	5			d	6	2	4	
September	a	46	66	56	86	March	a	51	65	58	85
	b	32	27	30			b	28	25	27	
	c	11	3	7			c	13	6	9	
	d	11	4	7			d	8	4	6	

(*continued.*)

(*continued from p. 56.*)

		Per-centages.			
		Wind.	Weather.	Average.	a + b.
The entire year	a	52	66	59	84
	b	27	23	25	
	c	14	7	11	
	d	7	4	5	

APPENDIX VIII.

Telegraphic Weather Intelligence.

The Meteorological Office issues notices of atmospherical disturbances on or near the coasts of the British Islands (free of charge) to ports and fishing stations recommended by responsible local authorities.

The fact that one of these notices has been received at any station, is made known by hoisting a black canvas cone, 3 feet high and 3 feet wide at base, which has the appearance of a triangle when hoisted. The telegram directing the cone to be hoisted should be exhibited near the signal staff.

At dusk, whenever a signal ought to be flying if it were daylight, a night signal consisting of three lanterns hung on a triangular frame, may be hoisted in place of the cone.

The Meteorological Office supplies the canvas cone, but does not undertake to supply the lanterns. In all cases the local authorities must undertake the charges incidental to the hoisting of the signal, such as flagstaff and gear, oil, &c., and also as to the keeping of the apparatus in repair, painting, &c.

The following is a list of the stations at which the signals are hoisted. They are situated, 101 in England and Wales, 47 in Scotland, 21 in Ireland, 3 in the Isle of Man, and 3 in the Channel Islands :—

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.E.	IRELAND, S.W.	ENGLAND, S.W.	ENGLAND, E.
Lerwick.	New Ross.	Scilly.	Harwich.
Scalloway.	Dunmore East.	St. Sennen.	Ipswich.
Dunrossness.	Dungarvan.	Newlyn, West.	Southwold.
Stromness.	Youghal.	Penzance.	Yarmouth.
Kirkwall.	Queenstown.	The Lizard.	Cromer.
Holborn Head.	Passage.	Falmouth.	Sheringham.
Dunnet Head.	Cork.	Pendennis.	Lynn.
Wick.	Kinsale.	Mevagissey.	Sutton Bridge.
Avoch.	Do. (Old Head).	Devonport.	
Inverness.	Brow Head.	Plymouth.	
Nairn.	Tralee.	Prawle Point.	
Burghead.	Limerick.	Teignmouth.	
Lossiemouth.	Galway.	Exmouth.	
Buckie.			
Port Knockie.			
Cullen.	IRELAND, N.W.		
Portsoy.			
Banff.	Rathmullan.		
Fraserburgh.	Malin Head.		
Peterhead.	Portrush.	ENGLAND, S.	ENGLAND, N.E.
Aberdeen.	Port Ballintrae.		
		Guernsey.	Boston.
		St. Helier's (Jersey).	Cleethorpes.
	IRISH SEA.	Gorey (Jersey).	Grimsby.
		Weymouth.	Goole.
SCOTLAND, E.	Belfast.	Poole.	Hull.
	Donaghadee.	Cowes.	BridlingtonQuay.
Stonehaven.	Howth.	Ryde.	Flamborough Head.
Montrose.	Kingstown.	St. Catherine's Point.	Filey.
Broughty Ferry.	Ramsey (I. of M.).	Portsmouth.	Whitby.
Dundee.	Douglas "	Southampton.	Redcar.
St. Andrews.	Castletown "	Littlehampton.	Middlesborough.
Anstruther.	Silloth.	Brighton.	West Hartlepool.
Pittenweem.	Maryport.	Newhaven.	Sunderland.
Burntisland.	Workington.		South Shields.
Grangemouth.	Whitehaven.		Tynemouth.
Bo'ness.	Barrow.		Berwick - on - Tweed.
Granton.	Morecambe.		
Newhaven.	Fleetwood.		
Leith.	Blackpool.		
Fisherrow.	Lytham.		
Dunbar.	Preston.		
Cockburnspath.	Southport.	ENGLAND, S.E.	
St. Abb's Head.	Liverpool.		
Eyemouth.	Runcorn.	Eastbourne.	
	Connah's Quay.	Hastings.	
	Penmaenmawr.	Rye.	
	Port Penrhyn.	Sandgate.	
	Port Dinorwic.	Folkestone.	
	Carnarvon.	Dover.	
	Holyhead.	Ramsgate.	
		North Foreland.	
		Margate.	
	ST. GEORGE'S CHANNEL.	Faversham.	
		Sheerness.	
	Aberystwith.	Chatham.	
	Milford.		

[*continued.*

NORTH.	WEST.	SOUTH.	EAST.
SCOTLAND, N.W.	BRISTOL CHANNEL.		
Stornoway.	Pembrey.		
Port of Ness (Island of Lewis).	Llanelly.		
	Swansea.		
	Briton Ferry		
	Porthcawl.		
	Penarth.		
	Cardiff.		
	Do. Barry Dock.		
SCOTLAND, W.	Newport.		
Glasgow.	Weston-super-Mare.		
Greenock.	Burnham.		
Rothesay.	Bridgewater.		
Campbelton.	Ilfracombe.		
Girvan.	Lundy Island.		
Ballantrae.	Barnstaple.		
	Appledore.		
	Boscastle.		
	Port Isaac.		
	Newquay.		
	Hayle.		
	St. Ives.		

APPENDIX IX.

Fishery Barometers.

List of Places supplied with Fishery Barometers.

Shetland Isles.—Balta Sound, Uya Sound, Burravoe, Nesting, Lerwick, Sandsair, Scalloway, Symbister.

Orkney Isles.—Westray, Papa, Burray, Kirkwall.

Scotland, east coast.—Duncansbay, Freswick, Auchengill, Keiss, Ackergill, Staxigoe, Wick, Lybster, Dunbeath, Portmahomack, Cromarty, Avoch, Nairn, Burghead, Portessie, Port Knockie, Portsoy, Whitehills, Gardenstown, Rosehearty, Pitullie, Fraserburgh, Inverallochy, Pointlaw, Findon, Portlethen, Skateraw, Stonehaven, Arbroath, Broughty Ferry, St. Andrews, Crail, Cellardyke, St. Monance, Burntisland, Newhaven.

England, east coast.—Berwick, North Shields, South Shields, Sunderland, West Hartlepool, Staithes, Scarborough, Filey, Flamborough, Bridlington Quay, Withernsea, Hull, Lynn (2), Wells, Gorleston, Lowestoft, Orford Haven, Woodbridge Haven, Harwich, Brightlingsea, West Mersea, Maldon, Margate, Deal, Kingsdown, Dover.

England, south coast.—Bognor, Ryde, Bembridge, Brixton, Atherfield, Ventnor, Gorey (Jersey), Haslar Hospital, Poole, Weymouth, Portland, Budleigh Salterton, Exmouth, Cawsand, Mevagissey, Gorranhaven, Devoran, Portscath, Penryn, Durgan, Porthallow, Falmouth, Coverack, Newlyn (2), Mousehole.

England, south-west coast.—St. Ives, Hayle, Port Isaac, Boscastle, Bideford, Burnham, Highbridge, Weston-super-Mare.

Wales.—Briton Ferry, Swansea, Angle, Milford, Aberystwith, Nevin, Carnarvon.

England, north-west coast.—Fleetwood, Morecambe, Maryport.

Isle of Man.—Douglas, Port St. Mary, Peel (2).

Scotland, south-west coast.—Port Patrick, Stranraer.

Ireland, east coast.—Cushendall, Belfast, Bangor, Groomsport, Donaghadee, Ardglass, Warren Point, Carlingford, Greenore, Dundalk, Malahide, Howth, Kingstown (2), Bray, Wicklow.

Ireland, south coast.—Dunmore East, Dungarvan, Crosshaven, Kinsale, Union Hall, Castletownsend, Baltimore, Schull (2), Crookhaven, Castletown (Berehaven), Ballycrovane.

Ireland, west coast.—Valencia, Dingle, Tralee, Tarbert, Kilcredane, Kilronan, Spiddal, Cleggan, Elly Bay, Ballyglass, Ballycastle (Co. Mayo), Donegal, Tribane, Killybegs, Teelin, Malinmore, Portnoo, Burton Port, Kincaslagh, Bunbeg.

Ireland, north coast.—Dunfanaghy, Rathmullen, Buncrana, Malin Head, Moville, Greencastle, Portstewart, Portrush, Ballycastle (Co. Antrim).

Scotland, west coast.—Tarbert (Loch Fyne), Campbeltown, Carradale, Portree, Armadale (Isle of Skye), Plockton, Gruinard, Ullapool, East Mey, Stroma.

Hebrides.—Stornoway, Portnaguiran, Obb, Valtos, Carloway, Ness.

Summary of Stations supplied with Instruments.

England and Wales - - - - -	71
Scotland and Isle of Man - - - -	70
Ireland - - - - - -	57
	198

APPENDIX X.

Methods followed in dealing with Meteorological Returns from Land Stations in the British Isles.

These stations are of five classes, as stated on page 16.

I.—*Observatories continuously observing all the Meteorological Elements.*

Returns from observatories.

Hourly measurements of the curves obtained from the self-recording instruments at the observatories of the Office are made by the observers at each station, on printed forms supplied for the purpose, which, together with the curves, are forwarded to the Office weekly. They comprise measurements of the barograms, of the dry-bulb and wet-bulb thermograms, of the anemograms, and of the rain-gauge curves.

Examination of returns.

The measurements are subjected to a careful examination in order to ensure as far as possible their accuracy, and the revised regulations which have been adopted to secure this end will be found in the Report of the Office for 1890. They comprise rules for the guidance of observers, as well as of the assistants charged with the examination of the work at the Office. Attention need be called here to only two of these rules, viz., (*a*) the use of subsidiary sheets on which are entered the results of a second set of measurements of the curves made after, and quite independently of, the first set, and with a different form of scale, the two sets of measurements being afterwards compared together, and any differences found inquired into and set right; and (*b*) the re-measurements of the curve made by the assistants at the Meteorological Office, and which always amount to 40, and in doubtful cases to many more, per month, for each element.

Results of examination and report to Council.

The attention of the observers is always drawn to such errors as may be detected, and to any failures in the continuity of the curves arising from failure of the light, stoppage of the clock, defective photography, faulty action of the wet-bulb thermometer, &c.; a report containing the results of the examination of each Observatory being also submitted to the Council periodically. The curves and tabulations are eventually bound and stored in the Office.

General supervision of observatory work.

In connexion with this work should be mentioned the general watch which has to be kept over the working of the observatories and of the instruments, not only to secure uniformity amongst them and observance of rules, but also to guard against small changes which are liable to occur at certain times, especially with the thermographs, and which may affect the scale-values of the instrument or the datum lines used for the tabulation of the curves. About twice a year this work calls for special examination, entailing some considerable time and occasionally the engraving of new scales for measuring the curves.

Method of dealing with the Numerical Results from the Self-recording Observatories.

Interpolations.

In dealing with the tabulations the first step is to go over the sheets and fill up by interpolation, wherever possible, any gaps or breaks in the continuity of the record.

The records having been made as complete as possible, are then used for the calculation of daily and hourly mean values, for periods of five days, calendar months, and for the year; which, together with other data obtained from the same source, are published under the title of "Hourly Means of the Readings obtained from the Self-recording "Instruments at the Four Observatories under the Meteorological

" Council." The volume for 1891 is almost ready for issue, and some progress has been made with the calculations for the year 1892. See p. 17.

II.—*Anemographic Stations at which the Wind is recorded continuously.*

The anemograms received from Alnwick Castle, Deerness, Dublin, Fleetwood, Holyhead, North Shields, Scilly, and Yarmouth are regularly examined and tabulated in the Office, and the sheets bound up in volumes. Besides special inquiries on legal and other points that from time to time arise, and in which these documents are of high importance, the tabulations are always employed in the preparation of the various Reports issued by the Office. They are also regularly used in the checking of the Storm Warnings.

III.—*Land Stations of the Second Order.*

Origin and progress of system.

Ever since the year 1866 returns of more or less completeness have been received from land stations in the United Kingdom. In that year there was only one station, but by 1871 the number had increased to 15, and five years later to 49, including 14 stations belonging to the Royal Meteorological Society, copies of the returns from which were sent to the Office under a special arrangement with the Society.

At the end of March 1894 the total number of stations was 113, including 15 belonging to the Royal Meteorological Society and 19 belonging to the Scottish Meteorological Society.

It must, however, be observed that while this number is exclusive of the self-recording observatories and of the anemographic stations, it includes several others from which only very scanty information is received.

The stations are distributed as follows: 50 in England, 6 in Wales, 26 in Scotland, and 31 in Ireland.

The methods followed with regard to the examination and publishing of these returns have been fully detailed in previous reports, and need not now be repeated. The changes introduced into the volume for 1886 have been continued in those for later years. These refer to the barometer readings, which are now given at station-level instead of being reduced to the mean sea-level; and to the humidity, where the depression of wet-bulb is shown, the international forms A and B being modified accordingly.

The volume for 1890 contains returns from 68 stations.

Arrangements have been made under which it is hoped that the arrears of this publication will be rapidly reduced.

Reports from the Irish stations are regularly supplied to the Registrar-General for Ireland for his Weekly and Quarterly Returns.

New stations.

When an application for the adoption of a new station is received, a schedule is forwarded to the observer containing a series of questions as to the outfit of the station, the exposure of the instruments, and the influence likely to be exerted on their indications by surrounding objects, such as houses and trees. Only mercurial barometers are accepted, and only such as have been duly verified. All thermometers must have been tested at Kew. A plan of the station, showing the positions of the instruments with regard to neighbouring objects, is also required.

On the return of this schedule the answers are considered, and, where necessary, alterations are advised.

If, however, the existing arrangements are satisfactory, tables for reducing the barometer readings to 32° Fahrenheit at mean sea-level are prepared and duplicates sent to the observer, together with a set of Hygrometrical Tables, and a copy of "Instructions in the Use of Meteorological Instruments."

The first returns are compared and examined with special care, and a report of the result of the examination is forwarded to the observer, with instructions how best to improve and complete the returns.

There are still many parts of the British Islands very poorly represented by the existing stations, and any information for these districts would be valuable.

Sunshine records.

The daily records of sunshine which are now received from 51 Stations in the British Islands are examined generally, to guard against accidental changes in the adjustment of the instruments. Notes explaining any omission or accidental defect are added to the cards if required, and after their receipt has been acknowledged, they are duly stamped and dated and then stored in the Office.

Weekly totals.

A tabulation of these curves is published as part of the Weekly Weather Report, mentioned in Appendix VII., and for those stations which are also Stations of the Second Order the monthly totals of bright sunshine in hours, together with the per-centages of its possible duration, are published as Part IV. of "Returns from Stations of the Second Order." A table showing the daily amount of sunshine at Bunhill Row, one of the London stations, is also prepared quarterly for the Royal Meteorological Society.

Inspection.

The Stations of the Second Order are regularly inspected, the attention of the inspector being directed by the Office to any special point which may require investigation.

IV.—*Telegraphic Reporting Stations.*

Full particulars relating to these stations, the information received from them, and the method of dealing with that information, will be found in Appendix VII. to the Report for the year 1888–9. A paragraph in that Appendix (p. 60) explains the use that is made of the monthly schedules sent in by the observers.

V.—*Extra Stations.*

The returns from Stations of the Fifth Class are not regularly published by the Office, but they are available for any special investigation that may be taken up. The rainfall values at these stations are, however, copied and supplied to Mr. Symons, F.R.S., for publication in "British Rainfall."

List of Stations.

In Appendix XI., page 64, is given a complete list of the stations supplying information to the Office.

APPENDIX XI.

List of Stations in the British Islands from which Information has been received at the Meteorological Office during the year ending March 31st 1894.

The Stations marked "S" are in connexion with the Scottish Meteorological Society, and those marked "M" are in connexion with the Royal Meteorological Society. The returns from these Stations are received by the Office under an arrangement which will be found detailed in previous reports.

In certain cases where the actual station at which the Observations have been taken is not generally known, and could not be readily identified, the name of some village or town near has been inserted, with the name of the station following within brackets.

The nature of the information received from each station is indicated by letters as follows :—

A. *Observatories.*—Continuous record of pressure, temperature, wind, sunshine and rain, with eye observations of the amount, form, and motion of the clouds, and notes on the weather.

B. *Anemograph Stations.*—Continuous record of the direction and velocity (or force) of the wind.

C. *Barograph Stations.*—Continuous record of pressure.

D. *Second Order Stations.*—Regular observations at 9 a.m. and 9 p.m. each day, local time, of pressure, temperature (dry-bulb and wet-bulb), wind, cloud, and weather, with the daily maxima and minima of temperature, the daily rainfall, and general remarks on the weather.

E. *Second Order Stations.*—Monthly means and summaries on Form B. of observations taken at 9 a.m. and 9 p.m , each day as above.

F. *Climatological Stations.*—The maximum and minimum temperature and the rainfall for each day, with remarks on the weather. This information is sent to the Meteorological Office each week for use in the "Weekly Weather Report."

G. *Third Order Stations.*—Observations of the same kind as at Second Order Stations, but either :—

(*a*) less full.
(*b*) taken only once daily.
(*c*) taken at irregular hours.

R. *Rainfall Stations.*—Daily observations of the amount of rainfall, with remarks on the weather.

S. *Sunshine Stations.*—Continuous record of bright sunshine.

T. *Telegraphic Stations.*—Regular observations at 8 a.m. and 6 p.m. G.M.T. (and from some stations at 2 p.m. in addition), of pressure, temperature, wind and weather, with the daily maxima and minima of temperature, the daily rainfall, and, where possible, the sea-disturbance at 8 a.m. each day and the daily amount of bright sunshine. This information is sent to the Meteorological Office each day by telegraph, for use in the "Daily Weather Report" and, as required, for use in the "Weekly Weather Report."

W. *Sea-temperature.*—Daily observations of the temperature of the sea water.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Aberdeen (Observatory) -	57° 10′ N.	2° 6′ W.	46	Prof. C. Niven -	A. T.
„ (Cove Bay) -	57 9 „	2 5 „	—	Coastguard - -	W.
Alnwick Castle - -	55 25 „	1 43 „	210	Humphry Willyams, for the Duke of Northumberland.	B. F.
Ardrossan, Ayrshire -	55 38 „	4 50 „	15	J. W. Mayes -	T.
Arlington Court, Barnstaple.	51 8 „	3 58 „	613	W. Stewart, for Lady Chichester.	F.
Armagh Observatory -	54 21 „	6 39 „	196	J. L. E. Dreyer -	B.D.F.S.
Arran, North, Galway -	53 6 „	9 40 „	—	Coastguard - -	G. W.
Aysgarth Vicarage, Bedale, Yorks.	54 18 „	1 58 „	646	Rev. F. W. Stow -	D.
Bahama Bank Lightship	54 20 „	4 13 „	—	Light-keepers -	W.
Ballantrae, Ayrshire -	55 6 „	5 0 „	—	Coastguard - -	W.
Ballycastle, Co. Antrim -	55 16 „	6 14 „	—	„ - -	G.
Ballydonegan, Berehaven -	51 38 „	10 3 „	—	„ - -	W.
Ballyglass, Co. Mayo -	54 17 „	9 52 „	—	„ - -	W.
Baltimore, Co. Cork -	51 28 „	9 22 „	—	„ - -	G.
Bantry - - -	51 41 „	9 27 „	—	R. Brennan - -	R.
Bawtry (Hesley Hall), Notts.	53 26 „	1 2 „	65	B. I. Whittaker -	F.
Belmullet, Co. Mayo -	54 13 „	9 59 „	40	Miss M. J. Tolan -	T.
Ben Nevis - - -	56 48 „	5 8 „	4,406	R. T. Omond, for Directors Ben Nevis Observatory.	A.
M Bennington, Herts. -	51 54 „	0 5 „	407	Rev. J. D. Parker -	E.
M Berkhamstead - -	51 46 „	0 34 „	400	E. Mawley - -	E.
M Blackpool - - -	53 48 „	3 3 „	31	A. J. Anderson -	F. S
Blacksod Point, Co. Mayo -	54 6 „	10 4 „	—	Coastguard - -	W.
Bolton (Chadwick Museum)	53 35 „	2 27 „	389	W. W. Midgley -	G.
Bournemouth - -	50 43 „	1 53 „	—	Messrs. Primavesi for Town Council.	S.
S Braemar - - -	57 0 „	3 24 „	1,111	J. Aitken - -	D. F. S.
Bray, Co. Wicklow -	53 12 „	6 6 „	—	Coastguard - -	G.
Brighton - - -	50 49 „	0 8 „	—	A. Newsholme -	S.
Bristol - - -	51 28 „	2 35 „	92	J. Harvey Jones -	F.
Broadford (Hurdlestown), Co. Clare.	52 48 „	8 38 „	157	Capt. W. O. Bentley, R.A.	R.
Brookeborough (Colebrooke Park), Co. Fermanagh.	54 21 „	7 22 „	271	W. Ferguson -	D. F.
Burnmouth, Ayton, Berwick	55 51 „	2 4 „	—	Coastguard - -	W.
Burntisland - - -	56 4 „	3 14 „	—	„ -	W.
M Buxton - - -	53 14 „	1 54 „	987	E. J. Sykes - -	E.
Caernarvon Bay Lightship	53 6 „	4 45 „	—	Light-keepers -	W.
S Callton Mor - - -	56 8 „	5 30 „	132	J. Russell (for John Malcolm of Poltalloch).	E.
Cambridge - - -	52 13 „	0 6 E.	88	P. Morris - -	T. S.
Cardigan Bay Lightship -	52 25 „	5 1 W.	—	Light-keepers -	W.
S Cargen - - -	55 2 „	3 37 „	72	P. Dudgeon and A. Peacock.	E.
M Carmarthen - - -	51 52 „	4 18 „	188	G. J. Hearder -	D.
Castletownshend, Co. Cork	51 32 „	9 19 „	—	Coastguard - -	G.
Chatham - - -	51 23 „	0 32 E.	136	The Instructor in Surveying.	G.
M Cheadle - - -	52 58 „	1 57 W.	646	J. C. Philips -	E. F.
M Cheltenham - - -	51 54 „	2 3 „	184	R. Tyrer - -	E.
Chilworth, Surrey -	51 13 „	0 32 „	307	C. S. Bell - -	D.
M Churchstoke - -	52 31 „	3 5 „	538	P. Wright - -	D. F. S.
Cirencester - - -	51 43 „	1 57 „	446	Prof. Ohm -	F. S.
Cleggan, Co. Galway -	53 33 „	10 8 „	—	Coastguard - -	W.
Clonakilty, Co. Cork -	51 37 „	8 50 „	—	E. Moore - -	R.
Coningbeg Lightship -	52 2 „	6 40 „	—	Light-keepers -	W.
Cooper's Hill, Egham -	51 26 „	0 34 „	279	Prof. H. McLeod -	G.
S Crieff (Ochtertyre) -	56 23 „	3 53 „	329	G. Croucher for Sir P. K. Murray, Bt.	E. F.
Cromarty - - -	57 41 „	4 0 „	—	Coastguard - -	W.
Crookhaven - - -	51 28 „	9 43 „	—	„ - -	G.
Crosshaven - - -	51 48 „	8 18 „	—	„ - -	G.
Cuckfield, Sussex - -	51 1 „	0 9 „	389	John Howe - -	R.
M Cullompton - - -	50 51 „	3 23 „	202	T. Turner - -	F. S.
Daunt's Rock Lightship -	51 43 „	8 16 „	—	Light-keepers -	W.
Deerness, Orkney Islands -	58 56 „	2 45 „	169	M. Spence - -	B. D. S.
Donaghadee - - -	54 38 „	5 32 „	26	T. MacGowan -	T.
Doneraile, Co. Cork -	52 13 „	8 34 „	—	Captain Evans -	R.
Douglas (Cronkbourne) Isle of Man.	54 10 „	4 29 „	137	A. W. Moore -	D. F. S.
Dublin (Botanic Gardens, Glasnevin).	53 23 „	6 16 „	67	F. W. Moore -	D.
Dublin (City) - -	53 20 „	6 15 „	47	J. W. Moore -	D. F.

	Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
	Dublin (Mountjoy Observatory, Phœnix Park).	53 22 N.	6 21 W.	155	Lt.-Col. Kirkwood, R.E.	B. D. S.
S	Dundee	56 28 „	2 56 „	160	J. Carnochan	D.
	Dunfanaghy (Sheephaven)	55 11 „	7 58 „	—	Coastguard	W.
	Dungeness	50 55 „	0 59 E.	26	W. Batton	T.
S	Dunrobin Castle	57 59 „	3 56 W.	12	D. Melville, for the Duke of Sutherland.	D.
	Durham	54 46 „	1 35 „	336	H. J. Carpenter	D. F. S.
	Eastbourne	50 46 „	0 17 E.	38	R. Sheward	D. S.
	East Goodwin Lightship	51 13 „	1 36 „	—	Light keepers	W.
	Edgeworthstown (Currygrane).	53 45 „	7 39 W.	267	J. M. Wilson	D. F.
	Edinburgh	55 57 „	3 12 „	253	R. C. Mossman	D. S.
	English and Welsh Grounds Lightship.	51 27 „	3 0 „	—	Light-keepers	W.
	Ennis, Co. Clare	52 51 „	8 59 „	18	J. Hill and P. L. K. Dobbin.	R.
	„ (Roslevan)	52 51 „	8 59 „	40	Mrs. J. W. Scott	R.
	Epsom (Royal Medical College).	51 20 „	0 14 „	294	C. I. Gardiner	D.
	Falmouth	50 9 „	5 4 „	167	E. Kitto	A. F.
	Fleetwood	53 56 „	3 1 „	—	M. S. Gaulter	B.
S	Fort Augustus	57 8 „	4 40 „	68	Rev. M. Wall	E. F. S.
S	Fort William	56 48 „	5 6 „	32	R. T. Omond for Directors, Ben Nevis Observatory.	A. F.
	Foynes, Co. Limerick	52 37 „	9 7 „	108	Lord Monteagle	F.
	Galway	53 17 „	9 3 „	—	Lieut. C. G. F. Law	G.
	Geldeston, Beccles	52 28 „	1 31 E.	37	E. T. Dowson	D. F. S.
	Glasgow	55 53 „	4 18 W.	180	Prof. L. Becker	A. D. F.
S	Glencarron	57 30 „	5 14 „	489	D. D. Munro	E. F.
S	Glenlee	55 5 „	4 12 „	203	W. Melville	E. F.
S	Gordon Castle	57 37 „	3 5 „	101	J. Webster (for the Duke of Richmond and Gordon, K.G.).	E.
	Gorleston, Suffolk	52 35 „	1 43 E.	—	R. J. C. Day	G.
	Guernsey (St. Peter's)	49 32 „	2 32 W.	—	F. E. Carey	S.
	Harpenden, Herts.	51 49 „	0 20 „	419	T. Wilson	G.
	Haslar Hospital, Hants	50 47 „	1 7 „	—	G. Coppen	G.
	Hawes Junction	54 19 „	2 18 „	1135	W. H. Bunce	T.
M	Hereford	52 5 „	2 45 „	274	T. A. Chapman	F.
	Heysham Hall, Lancashire	54 3 „	2 54 „	95	S. Lomas for Miss L. Grafton.	D.
M	Hillington	52 48 „	0 33 E.	88	Rev. H. E. B. Ffolkes	D. F. S.
	Holyhead (Harbour Office)	53 18 „	4 39 W.	—	F. M. Cotton	B. W.
	„ (Sailors' Home)	53 18 „	4 39 „	48	T. Chope	T.
	Hurst Castle	50 42 „	1 33 „	12	E. T. Tremble	T.
	Jersey (St. Aubins)	49 12 „	2 11 „	25	J. Fisher	T.
	„ (St. Heliers)	49 11 „	2 6 „	—	Signal Officer Fort Regent.	S.
	Kearsney Abbey (Dover)	51 8 „	1 17 E.	100?	C. W. Curtis	R.
	Ketton, Stamford	52 39 „	0 33 W.	—	F. Coventry	F. G.
	„ „ (The Holmes)	52 39 „	0 33 „	—	„	R.
	Kew Observatory	51 28 „	0 19 „	18	C. Chree	A.
	Kilcredane, Co. Clare	52 35 „	9 47 „	—	Coastguard	W.
	Kilkenny	52 39 „	7 14 „	212	H. Carlton, for the Marquis of Ormonde.	C. F.
M	Killarney	52 4 „	9 30 „	86	Ven. Archdeacon Wynne.	E. F.
	Killiney (Cloneevin), Co. Dublin.	53 16 „	6 7 „	—	R. O'Brien Furlong	R.
	Kirkwall	58 59 „	2 57 „	—	Coastguard	W.
	Kish Bank Lightship	53 19 „	5 55 „	—	Light keepers	W.
	Ladylaw (Hawick)	55 28 „	2 47 „	439	W. R. Wilson	C. D.
S	Lairg	58 1 „	4 22 „	335	J. Young	E. F.
	Lamlash, Isle of Arran, Scotland.	55 32 „	5 8 „	—	Coastguard	W.
	Laudale, Argyleshire	56 41 „	5 41 „	14	A. Fletcher for T. H. G. Newton.	D. F.
	Laugharne, Carmarthenshire.	51 47 „	4 28 „	15	R. W. Pinney	R.
S	Lednathie	56 45 „	3 7 „	719	W. Morrison (for Stormonth Darling).	E.
	Leith	55 58 „	3 10 „	20	T. Richardson	T.
	Leman and Ower Lightship.	53 °8 „	2 2 E.	—	Light-keepers	W.
	Lerwick	60 9 „	1 8 W.	—	Coastguard	W.
S	Lissan, Co. Tyrone	54 41 „	6 45 „	305	Sir Nathaniel Staples, Bart.	E.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Liverpool (Bidston Observatory).	53 24 N.	3 4 W.	188	W. E. Plummer	D. T.
Liverpool (North-West Lightship).	53 31 „	3 31 „	—	Light-keepers	W.
Llandinam, Montgomerysh.	52 30 „	3 26 „	496	Edward Davies	R.
Llandovery	51 59 „	3 48 „	217	J. Watkins	F.
⚓ Llandudno	53 21 „	3 50 „	88	J. Nicol	E. F. S.
London (Brixton)	51 29 „	0 7 „	77	F. Gaster	T.
„ (City)	51 32 „	0 5 „	80	Messrs. de la Rue	S.
„ (Pall Mall)	51 32 „	0 8 „	—	Athenæum Club	C.
„ (Westminster)	51 31 „	0 8 „	76	The Staff of the Met. Office.	B. S.
Londonderry	55 0 „	7 19 „	67	J. Conroy	D. F.
Loughborough	52 47 „	1 12 „	169	W. Berridge	T.
Lowestoft	52 29 „	1 44 E.	—	J. Andrew	G.
Malin Head, Co. Donegal	55 23 „	7 25 W.	230	O. O'Doherty	T.
Manchester	53 29 „	2 13 „	190	J. Tatham	G. S.
S Marchmont	55 44 „	2 25 „	498	P. Loney for Sir H. P. Campbell, Bt.	E. F. S.
⚓ Margate	51 24 „	1 24 E.	83	J. Stokes	D. S.
Market Rasen	53 23 „	0 20 W.	83	W. B. Jevons	R.
Markree Castle, Co. Sligo	54 11 „	8 27 „	122	A. Marth for Col. Cooper.	D. F. S.
Minard, Co. Kerry	52 7 „	10 8 „	—	Coastguard	W.
Mold (Penbedw)	53 12 „	3 16 „	650	H. W. Buddiwm	C.
Montrose (Uzon)	56 40 „	2 28 „	—	Coastguard	W.
Morpeth	55 11 „	1 40 „	—	Captain H. Terry	G.
Mount Nugent (Arley Cottage).	53 50 „	7 18 „	262	Major Somerset H. Maxwell.	D. S.
Nairn	57 36 „	3 52 „	84	Miss Penny	T.
Newarp Lightship	52 45 „	1 53 E.	—	Light-keepers	W.
Newport (Ynis-y-bro), Mon.	51 38 „	3 3 W.	115	F. W. Houghton	R.
Newquay, Cornwall	50 25 „	5 5 „	—	J. Pearce	S.
„ „	50 25 „	5 5 „	—	Coastguard	W.
Northallerton	54 20 „	1 26 „	130	W. Stead	R.
North Foreland	51 23 „	1 27 E.	115	A. Cox	T.
Omagh (Edenfel)	54 36 „	7 19 W.	300	Col. Buchanan	F.
Oswaldkirk, Yorks.	54 12 „	1 3 „	—	R. Thompson	S.
Outer Dowsing Lightship	53 27 „	1 5 E.	—	Light-keepers	W
Owers Lightship	50 39 „	0 41 W.	—	„	W
Oxford	51 46 „	1 16 „	208	W. Wickham for E. J. Stone.	T. S.
Parkstone, Dorset	50 43 „	1 56 „	197	R. H. Barnes	D.
Parsonstown (Birr Castle)	53 6 „	7 55 „	175	O. Boeddicker, for Earl of Rosse.	D. S. T.
Pembroke (St. Ann's Head).	51 41 „	5 11 „	150	H. T. Knott	T. S. W.
Pennant Bay, Aberdour	57 40 „	2 16 „	—	Coastguard	W.
S Pinmore (Girvan)	55 12 „	4 49 „	187	P. Donald for Capt. Hamilton.	E.
Plymouth	50 22 „	4 8 „	116	H. V. Prigg	D. F. S.
Portrush	55 13 „	6 40 „	—	Coastguard	W.
Prawle Point	50 12 „	3 43 „	332	M. Holmes	T.
Prestwich	53 32 „	2 17 „	294	T. R. H. Clunn	D. F. S.
Roche's Point, Cork	51 47 „	8 19 „	42	W. Kennedy	T.
S Rosewell	55 51 „	3 7 „	690	R. W. D. Cameron	E.
Rothamsted	51 48 „	0 22 „	368	Sir J. B. Lawes and Sir J. H. Gilbert.	F. S.
S Rothesay	55 50 „	5 4 „	115	J. Kay	E.
⚓ Rounton, Northallerton	54 24 „	1 18 „	249	Sir I. L. Bell, Bart.	E.
⚓ Rousdon, Devon	50 42 „	3 0 „	523	C. E. Peek	E.
Roxborough, Co. Limerick	52 39 „	8 36 „	—	A. W. Shaw	R.
Royal Sovereign Lightship.	50 43 „	0 27 E.	—	Light-keepers	W.
Rugby	52 22 „	1 15 W.	379	H. P. Highton	G.
St. David's	51 53 „	5 16 „	215	W. P. Propert	D.
St. Helen's, Lancashire	53 28 „	2 45 „	151	J. Robertson	G.
St. Leonards	50 51 „	0 33 E.	129	H. Colborne	D. F. S.
Salcombe, Kingsbridge	50 14 „	3 46 W.	—	Coastguard	W.
Sandgate, Kent	51 4 „	1 9 E.	—	H. E. Stilgoe	R.
⚓ Scarborough	54 17 „	0 23 W.	159	Dr. H. G. H. Monk	D. F.
„	54 17 „	0 23 „	—	Coastguard	W.
Schull	51 32 „	9 32 „	—	„	G.
Scilly Islands (St. Mary's)	49 56 „	6 18 „	80	A. Hicks	B. S. T. W.
Seafield (Co. Clare)	52 48 „	9 30 „	—	Coastguard	W.
Seaham	54 50 „	1 19 „	148	G. H. Aird	D.
Sedbergh	54 19 „	2 32 „	400	E. C. Malan	R.
Seven Stones Lightship	50 4 „	6 5 „	—	Light-keepers	W.
Shambles Lightship	50 31 „	2 20 „	—	Light-keepers	W.
Sheffield	53 23 „	1 29 „	429	E. Howarth	D.

Station.	Lat.	Long.	Height in feet above M.S.L.	Observer.	Nature of Information supplied.
Sherborne (Stowell), Dorset.	50° 57′ N.	2° 31′ W.	376	Rev. H. J. Poole	F.
Shields, North	55 0 „	1 27 „	97	J. W. Irvine	T.
Shields, North, Old Lighthouse.	55 0 „	1 27 „	—	Captain Harrison	B.
Shipwash Lightship	52 2 „	1 38 E.	—	Light-keepers	W.
Solway Lightship	54 48 „	3 32 W.	—	Light-keepers	W.
Southampton	50 55 „	1 24 „	78	J. T. Cook for Dir. Gen. of Ordnance Survey.	D.F.S.
South Rock Lightship	54 25 „	5 22 „	—	Light keepers	W.
Spidall, Co. Galway	53 15 „	9 17 „	—	Coastguard	G.
Spurn Head	53 34 „	0 7 „	19	G. Freeman	T.
Spurn Lightship	53 34 „	0 13 E.	—	Light-keepers	W.
Stokesay, Craven Arms	52 26 „	2 52 W.	370	Miss M. A. Digges La Touche.	D.
Stonyhurst College	53 51 „	2 28 „	375	Rev. W. Sidgreaves	A.D.F.
Stornoway	58 11 „	6 22 „	28	J. Forbes	T.S.
„	58 11 „	6 22 „	—	Coastguard	W.
Stranraer	54 54 „	5 2 „	—	Patrick Doran	G.
Strathfield Turgiss, Hants	51 20 „	1 0 „	195	Rev. C. H. Griffith	F.
Sumburgh Head (Dunrossness).	59 51 „	1 17 „	126	Rev. W. Brand	T.
Sunderland	54 54 „	1 23 „	—	Coastguard	W.
Sutton Coldfield	52 34 „	1 49 „	392	C. F. Marston	S.
Symbister, Shetlands	60 14 „	1 25 „	—	J. S. Nicolson	G.
Tarbert, Harris	57 53 „	6 47 „	—	D. Bethune	G.
Tealby, Lincolnshire	53 24 „	0 16 „	251	Rev. S. Lewin	D.
Teelin, Donegal	54 38 „	8 39 „	—	Coastguard	W.
Tenby	51 41 „	4 42 „	79	J. E. Gower	S.
Thurcaston, Leicester	52 42 „	1 10 „	253	Rev. T. A. Preston	S.
Torquay	50 28 „	3 31 „	—	A. Chandler	S.
Totland Bay, Isle of Wight	50 41 „	1 33 „	84	J. Dover	G.
Union Hall, Co. Cork	51 33 „	9 8 „	—	Coastguard	G.
Uppingham	52 35 „	0 44 „	484	Rev. G. H. Mullins	D.
Valencia Observatory, Cahirciveen.	51 56 „	10 15 „	80	J. E. Cullum	A. T.
„ Island (Glanleam)	51 55 „	10 20 „	—	Miss E. FitzGerald	R.
„ (Knightstown)	51 55 „	10 20 „	—	Coastguard	G.
Wakefield	53 41 „	1 30 „	96	H. Clarke	E.
Waterford (Brook Lodge)	52 15 „	7 6 „	104	C. P. Bolton	C. F.
Waterford	52 15 „	7 8 „	—	Harbour Authorities	C.
Westbourne, Sussex	50 52 „	0 55 „	—	Rev. L. B. Birkett	S.
Westray, Orkney	59 17 „	3 0 „	—	J. Hewison	G.
Wick	58 27 „	3 6 „	80	J. Sinclair	T.
Wick	58 27 „	3 6 „	—	Coastguard	W.
Wolfelee	55 23 „	2 39 „	587	W. Cockburn	D.
Worksop	53 18 „	1 8 „	—	H. Mellish	S.
Yarmouth	52 37 „	1 43 E.	10	G. T. Watson	B. T.
York (Boothgate)	53 57 „	1 5 W.	—	J. E. Clark	S.
„ (The Museum)	53 57 „	1 5 „	51	H. M. Platnauer	D. T.

In addition to the above, reports are received daily from the following Continental Stations.

Station.	Authority.	Station.	Authority.
Haparanda	Meteorological Office, Sweden.	†The Helder	Bureau Central Météorologique, Paris.
Hernösand		Cape Gris Nez	
†Stockholm		†Brest (St. Mathieu)	
Wisby		Lorient (Ile de Groix)	
		*†Rochefort (Ile d' Aix)	
Bodö	Meteorological Institute, Norway.	†Biarritz	
†Christiansund		†Paris	
*†Skudesnaes		Belfort	
Færder		Lyons	
		Nice	
†The Scaw	Meteorological Institute, Denmark.	Perpignan	Cent. Met. Inst. of Germany.
Fanö		Berlin	
Cuxhaven	Deutsche Seewarte, Hamburg.	Wiesbaden	
		Munich	
		Corunna	Observatory, Lisbon.
		†Lisbon	

Note.—The stations marked with an asterisk (*) report also at 2h. p.m., and those with dagger (†) at 6h. p.m.; Lisbon reports at 4h. p.m. instead of 6h. p.m.
The Helder does not send reports at 6 p.m. on Sundays.

APPENDIX XII.

Accessions to the Library during the Year ending 31st March 1894.

Accra.—Meteorological observations recorded at theAccra Observatory. By J. F. Easmon. 1891, Jan.–1892, Dec. la. f°. Sheets.

Adelaide Observatory.—Meteorological observations made at the Adelaide Observatory, and other places in South Australia and the Northern Territory, during the years 1884–87, under the direction of C. Todd. 2 vols. sm. f°. Adelaide, 1893.

[———] Rainfall in South Australia and the Northern Territory during 1892; with weather characteristics of each month. By C. Todd. sm. f°. Adelaide, 1893.

Aitken, John.—On the colour of the Mediterranean and other waters. 8° (*Proc. R. Soc. Edinb.*, xi., 1881–82, *p.* 472.)

‖ ——— On some observations made without a dust counter on the hazing effect of atmospheric dust. 8°. (*Proc. R. Soc. Edinb.*, xx., 1893, *p.* 76.)

‖ ——— Breath figures. 8°. (*Proc. R. Soc. Edinb.*, xx., 1893, *p.* 94.)

——— On the number of dust particles in the atmosphere of certain places in Great Britain and on the Continent, with remarks on the relation between the amount of dust and meteorological phenomena. Part ii. la. 4°. Edinburgh, 1892 (*Trans. R. Soc. Edinb.*, xxxvii., *Part* i., *p.* 17.)

‖ ——— On the particles in fogs and clouds. la. 4°. Edinburgh, 1893. (*Tran R. Soc. Edinb.*, xxxvii., 1893, *p.* 413.)

Åkerblom, P.—De l'emploi des photogrammètres pour mesurer la hauteur des nuages. la. 8°. Upsala, 1894.

[Algiers, Service Météorologique du Gouvernement Général de l'Algérie.]—Bulletin météorologique de l'Algérie. 1893, Jan. 1–Dec. 31. sm. f°. Sheets.

[Allahabad, Meteorological Office.]—Brief sketch of the meteorology of the North-Western Provinces and Oudh and adjacent parts of Rajputana and the Panjab for the year 1892. sm. f°. s.l.e.a.

Amsterdam, Kon. Nederlandsch Aardrijkskundig Genootschap.—Nomina geographica Neerlandica. Geschiedkundig onderzoek der nederlandsche aardrijkskundige namen, . . . iii^de^ Deel. la. 8°. Leiden, 1893.

——— ——— Tijdschrift . . . onder redactie van C. M. Kan en J. Æ. C. A. Timmerman. Tweede serie. Deel x. 2 vols. 8°. Leiden, 1893.

Antigua, Government Laboratory. — Meteorological register for 1893 By F. Watts. (Suppl. to the Leeward Islands Gazette, 8th Feb. 1894.) la. 8°.

* ‖ **Arctic dispatches (The),** containing an account of the discovery of the North-West Passage by Capt. R. Maclure, commanding H.M.S. "Investigator." With a narrative of proceedings of H.M.S. "Resolute," Capt. Kellett, C.B., and the dispatches of Capt. Sir Edward Belcher, C.B., Capt. Inglefield, and Commr. Pullen. 8°. London, s.a. (*Naut. Mag.*, 2*nd ser.*, xxii., 1853, *pp.* 577 *and* 617.)

* ——— **Sea.**—Letters written during the late voyage of discovery in the Western Arctic Sea. By an Officer of the Expedition. 8°. London, 1821. (*Voyages, Vol. V., published by Sir R. Phillips & Co.*)

Atmósfera, La.—Revista mensual . . . publicada por el Observatorio de Vilafranca del Panadés. Año i., 1892. 8°. Año ii., 1893. sm. f°. 2 vols. Vilafranca del Panadés, s.a.

L'Atmosphère.—Recueil de documents météorologiques publié par les soins de l'Observatoire de la Tour Saint-Jacques à Paris. la. 8°. Paris, 1893.

Note.—Books marked * have been acquired by purchase; the others are donations from institutions, societies, or authors. Those marked ‖ are excerpt papers, extra copies of which have been separately printed.

In some cases additional publications have been received besides those specified, but only completed volumes or years are given here.

* **August, E. F.** — Psychrometertafeln nach den neuesten Untersuchungen berechnet von E. F. August. sm. 8°. Berlin, 1848.

* **Babinet, [J.]**—Études et lectures sur les sciences d'observation et leurs applications pratiques. Vols. i.–viii. 8 vols., sm. 8°. Paris, 1855–68.

* **Baily, W.**—On an integrating anemometer. Read Dec. 8, 1883. 8°. (*Phil. Mag., ser.* 5, xvii., 1884, *p.* 482.)

(Barber, C. A.)—Rainfall returns, 1892—Dominica and Montserrat. la. 8°. (*Suppl. Leeward Islands Gazette, July* 6, 1893.)

Bárcena, M.—El clima de la Ciudad de México. 8°. México, 1893.

Batavia, Magnetical and Meteorological Observatory.—Observations . . . Published . . . under the direction of J. P. Van der Stok. Vol. xv., 1892. f°. Batavia, 1893.

[——— Observatorium.]—Regenwaarnemingen in Nederlandsch—Indië. xiv. Jaarg. 1892. 8°. Batavia, 1893.
Title and Preface in the English language also.

Bathurst, Gambia.—Comparative rainfall in the Colony of the Gambia. 1887–1891. sm. f°. Sheet.

——— Meteorological statistics. 1892. Slip.

Baxendell, J.—Abstracts of observations at the Southport meteorological observatory for the weeks ending Dec. 31, 1892 to Dec. 29, 1893. Slips.

|| **Bayard, F. C.**—The direction of the wind over the British Isles. 1876–80. la. 8°. (*Quart. Journ. R. Meteor. Soc.*, xix., 1893, *p.* 172.)

Belize.—Summary of meteorological observations at St. Joseph's Observatory during the months of Jan.—Dec. 1893. 4°. Sheets. (*The Angelus, Belize*, 1893–94.)

Ben Nevis.—Guide to Ben Nevis, with an account of the foundation and work of the meteorological observatory. sm. 8°. Edinburgh and Glasgow. s.a.

|| ——— Meteorological observations on Ben Nevis. Report of the Committee . . . Drawn up by Dr. Buchan. 8°. (*Rep. Br. Assoc. Adv. Sc.*, 1893.)

Benson, C.—An account of the normal distribution of the rainfall in the Madras Presidency, based on the records of twenty years. sm. f°. Madras, 1892.

Berlin, Deutsche Meteorologische Gesellschaft.—Berliner Zweigverein der deutschen meteorologischen Gesellschaft. 3.10.11. Vereinsjahr, 1886, 1893, 1894. 3 vols. 8°. Berlin, 1886, 1893, 1894.

——— **Königlich Preussisches Meteorologisches Institut.**—Bericht über die Thätigkeit . . . von W. v. Bezold. 1891, 1892. 2 vols. la. 8°. Berlin, 1893.

——— ——— Ergebnisse der meteorologischen Beobachtungen im Jahre 1890. la. 4°. Berlin, 1893.

——— ——— Ergebnisse der Niederschlags-Beobachtungen im Jahre 1891. la. 4°. Berlin, 1893.

|| ——— ——— Witterung nach den Beobachtungen des königlichen meteorologischen Instituts. 1893, Jan.–Dec. la. 4°. (*Statist. Korresp.*)

* **Bert, P.**—La pression barométrique. Recherches de physiologie expérimentale. la. 8°. Paris, 1878.

Bibliothèque Universelle [et Revue Suisse]. Archives des sciences physiques et naturelles. Troisième période. Tomes xxix.–xxx. 2 vols. 8°. Genève, 1893.

|| **Bidwell, S.**—Fogs, clouds and lightning. 8°. [*Proc. R. Inst. Great Britain*, 1893, *May.*]

Birkenhead. Meteorological results. 1892. 8° (*Rep. on San. condition of Birkenhead for* 1892, *by R. S. Marsden, p.* 11.)

* **Blasius, W.**—Stürme und moderne Meteorologie. Vier Vorträge gehalten in Braunschweig. 1891–92. la. 8°. Braunschweig, 1893.

* **Blink, H.**—Wind- und Meeresströmungen im Gebiet der kleinen Sunda Inseln. la. 8°. (*Beitr. z. Geophys., Abhandl. geogr. Seminar. Univ. Strassburg, I. p.* 1, *Stuttgart*, 1887.)

|| **Boedl, W.**—Die Schneedecke in Bayern im Winter 1891–92. 4°. (*Beob. meteor. Stat. K. Bayern*, xiv., 1892.)

Bombay, Government Observatory.—Magnetical and meteorological observations made at the Government Observatory, Bombay, in the years 1891 and 1892, under the direction of C. Chambers and C. Chambers, jun., together with an appendix containing an account of a magnetic research. f°. Bombay, 1893.

(——— ———) Report on the condition and proceedings of the Government Observatory, Colába, for the year which ended with the 30th June 1893. f°. s.l.e.a.

[Bombay Meteorological Office.]—Brief sketch of the meteorology of the Bombay Presidency in 1892–93. f°. s.l.e.a.

‖ **Boston, Mass., Weather Bureau.**—Annual summary of the New England Weather Service for the year 1892. la. 4°. Cambridge, Mass., 1893. (*Ann. Astr. Obs. Harvard Coll.*, xli., *Part* i.)

——— Bulletin of the New England Weather Service. 1893, Jan.–Dec. 4°. s.l.e.a.

Bougainville, [L. A.] de.—The History of a voyage to the Malouine (or Falkland) Islands, made in 1763 and 1764.

See PERNETTY, A. J.

Bremen, Meteorologische Station I. Ordnung. — Deutsches meteorologisches Jahrbuch für 1892. Ergebnisse der meteorologischen Beobachtungen. Herausgegeben von P. Bergholz. Jahrg. iii. la. 4°. Bremen, 1893.

Brisbane, Post and Telegraph Department, Meteorological Branch.—Brisbane Observatory, Wickham Terrace. Meteorological synopsis. Jan.–Dec., 1891–1892. f°. Sheets. (*Suppl. Queensland Gov. Gazette*, 1891–93.)

——— ——— Table of rainfall. 1890. Jan.–Dec. f°. Sheets.

British North Borneo Herald and Official Gazette. Vol. xi. 1893. Nos. 1–12. f°. Sandakan, 1893.

Contains meteorological observations.

* **(Bruce, E. S.)** Town fogs: their amelioration and prevention. 8°. (*Dublin Rev., cxiv.*, 1894, *Jan.*, *p.* 132).

Brussels, Observatoire Royal.—Bulletin météorologique. 1893, Jan. 1–Dec. 31. f°. Sheets.

‖ **Buchan, [A.]** The temperature of London for 130 years, from 1763 to 1892. la. 8°. (*Journ. Scott. Meteor. Soc.*, *3rd ser.*, ix., *p.* 213.)

‖ ——— ——— The temperature of the North-east of Scotland for 129 years from 1764 to 1892. la. 8°. (*Journ. Scott. Meteor. Soc.*, *3rd ser.*, *ix.*, *p.* 224.)

Bucharest, Institutut Meteorologic al Romaniei.—Analele . . de S. C. Hepites. Tom. vi.–vii., 1890–1891. 2 vols. la. 4°. Bucuresti, 1893.

In the French language also.

Cairo, Ministère de l'Intérieur. Administration des Services Sanitaires et d'Hygiène Publique.—Bulletin hebdomadaire. 8me année, 1893 Nos. 1–52. Suppl. au Journ. Officiel, 1893–94. la. 4°.

[Calcutta, Meteorological Office, Bengal.]—Bay of Bengal weather chart. 1893, Jan. 1–Dec. 31. sm. f°. Sheets.

——— ——— Bengal daily weather report. 1893. sm. f°. Sheets.

These reports are only published during the rainy season.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the weeks ending January 7 to December 30, 1893. f°.

(——— ———) Meteorological and rainfall table of the Province of Bengal for the months of January to December 1893, with annual tables. sm. f°.

——— ——— Meteorological summary for the monsoon period of 1893. sm. f°. s.l.e.a.

(——— ———) Summary of the meteorology of Bengal for the year 1892. sm. f°. s.l.e.a.

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York, Yorkshire Philosophical Society.—Annual report . . . . for 1892. la. 8°. York, 1893.

Zenger, C.-V.—Le système du monde électro-dynamique. 8°. Paris, 1893.

Zi-ka-wei, Observatoire Magnétique et Météorologique. — Bulletin mensuel. Tome xviii., année 1892. sm. f°. Zi-ka-wei, 1893.

Zürich, Schweiz. Departement des Innern.—Graphische Darstellung der schweizerischen hydrometrischen Beobachtungen. 1893. la. f°. Sheets.
For the second half of the year the title is in French.

——— **Schweizerische Meteorologische Central-Anstalt.** — Annalen. 1891. "Der Schweiz. meteor. Beob." xxviii. Jahrg. 4°. Zürich, s.a.

——— ——— Instruktionen für die Beobachter der meteorologischen Stationen der Schweiz. Zweite umgearbeitete und vermehrte Auflage. la. 8°. Zürich, 1893.

——— ——— Wetterbericht. 1893, Jan. 1–Dec. 31. sm. f°. Sheets.

Account of Receipts and Payments for the year ending 31st March 1894.

Receipts.	£	s.	d.	Payments.	£	s.	d.	£	s.	d.
Balance from year 1892–93 -	1,500	8	2	Administration:						
				Payment of Council -	991	5	0			
				Secretary - -	800	0	0			
Parliamentary Vote - - -	15,300	0	0	Salaries and wages -	903	18	8			
				Rent, fuel, and lighting	704	13	11			
Repayment of expenses charged under—				Incidental and contingent expenses -	241	1	11			
(1.) Incidental expenses - 3 4 1				Furniture and fittings	161	4	8			
(2.) Observatories 37 11 7				Pensions - -	186	16	4			
	40	15	8					3,989	0	6
				Special Researches:						
				Salaries and other charges - -	-	-	-	787	6	11
Supply of Information:				Land Meteorology:						
Daily Weather Charts and Forecasts - 283 10 6				Observatories and stations, including remuneration of observers - -	2,390	17	10			
6 p.m. Charts - 25 0 0				Salaries: —Discussion and reduction of observations, &c. -	1,297	2	3			
Reports for Press Agencies, &c. 91 14 4								3,688	0	1
Telegrams - 288 17 2				Weather Information and Forecasts:						
	689	2	0	Telegraphic reports and storm warnings, remuneration of observers, &c. -	2,485	8	3			
Sale of Instruments, &c.:				Salaries: — Preparation and issue of reports and forecasts -	1,861	11	3			
Royal Navy - 3 10 8								4,346	19	6
Mercantile Marine account - 25 18 1				Inspections:						
M.O. (Stations) account - 30 15 0				Salaries and travelling expenses - -	-	-	-	589	6	7
	60	3	9	Ocean Meteorology:						
Repayment of Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c. - -	40	5	7	Salaries:—Discussion and reduction of observations - -	1,597	15	0			
Commission charged on work done for Colonies, &c. -	6	7	10	Expenses incidental to the supply of instruments:—						
				Proportion for care and issue of instruments - -	200	0	0			
				Royal Navy - -	525	12	1			
				Mercantile Marine -	355	2	3			
				Distant island and coast stations -	14	0	8			
								2,692	10	0
				Miscellaneous Commissions executed for Colonial and Foreign Institutions, &c. - -	-	-	-	26	6	6
				Balance:						
				Cash at Bank -	1,448	0	5			
				„ at Office -	69	12	6			
								1,517	12	11
£	17,637	3	0				£	17,637	3	0

In the year 1893–94 the sum of 1,475*l.* 3*s.* 10*d.* was paid to the Post Office on account of inland and foreign telegrams, allowances to telegraph clerks, rental of private wires, &c.

APPENDIX XIV.

LIST OF PUBLICATIONS, &c. issued under the Authority of the Meteorological Council.

OFFICIAL.

No. 1. Report of the Meteorological Committee for 1867. 1*s.*
2. Instructions for Meteorological Telegraphy. New Edition, 1891. Prepared for the use of observers exclusively.
3. Fishery Barometer Manual. (New edition, 1887.) 6*d.*
4. Charts showing the Surface Temperature of the South Atlantic Ocean in each Month of the Year. 2*s.* 6*d.*
5. Report of the Meteorological Committee for 1868. 5*d.*
6. Report of the Meteorological Committee for 1869. 10*d.*
7. Quarterly Weather Report for 1869.—Parts I. to IV. 5*s.* each.
8. Barometer Manual. (Out of print. See Nos. 3, 24, 40, 60, and 61.)
9. Quarterly Weather Report for 1870.—Parts I. to IV. 5*s.* each.
10. Report of the Meteorological Committee for 1870. 10*d.*
11. Contributions to our Knowledge of the Meteorology of Cape Horn and the West Coast of South America. 2*s.* 6*d.*
12. Currents and Surface Temperature of the North Atlantic Ocean, from the Equator to Lat. 40° N., for each month of the year, with a General Current Chart. 2*s.* 6*d.*
13. A Discussion of the Meteorology of that Part of the Atlantic lying North of 30° N., for the Eleven Days ending 8th February 1870. With Book of Charts, 5*s.*
14. Quarterly Weather Report for 1871.—Parts I. to IV. 5*s.* each.
15. Report of the Meteorological Committee for 1871. 10*d.*
16. Quarterly Weather Report for 1872.—Parts I. to IV. 5*s.* each.
17. Report of the Meteorological Committee for 1872. 1*s.*
18. Contributions to our Knowledge of the Meteorology of the Antarctic Regions. 2*s.*
19. Quarterly Weather Report for 1873.—Parts I. to IV. 5*s.* each.
20. Charts of Meteorological Data for Square 3. Lat. 0°—10° N. Long. 20° — 30° W., and Remarks to accompany the Monthly Charts, which show the Best Routes across the Equator for each Month, &c. 20*s.*
21. Report of the Proceedings of the Meteorological Congress at Vienna. 1873. 1*s.*
22. Report of the Meteorological Committee for 1873. 4*d.*
23. Report of the Proceedings of the Conference on Maritime Meteorology held in London, 1874. 2*s.*
24. Instructions in the Use of Meteorological Instruments. [Reprinted 1892.] (New edition in course of preparation.) 2*s.* 6*d.*
25. Quarterly Weather Report for 1874.—Parts I., II., and IV., 5*s.* each. Part III., 5*s.* 9*d.*
26. Report of the Meteorological Committee for 1874. 6*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 27. Charts of Meteorological Data for the Nine 10° Squares of the Atlantic which lie between 20° N. and 10° S., and extend from 10° to 40° W., with accompanying Remarks, ending with the Best Routes across the Equator. 24*s.*

28. Contribution to the Meteorology of Japan. By Staff-Commander Thomas H. Tizard, H.M.S. *Challenger.* 1*s.*

29. Report of the Meteorological Committee for 1875. 4*d.*

30. Quarterly Weather Report for 1875.—Parts I.—IV. 5*s.* each.

31. Report of the Meteorological Committee for 1876–7. 3*s.* 5*d.*

32. The Meteorology of the North Atlantic during August 1873, with 31 Synoptic Charts. With Book of Charts. 15*s.*

33. Quarterly Weather Report for 1876 (New Series).—Part I., 6*s.*; Parts II., III., and IV., 5*s.* each.

*33A. Meteorological Observations at Stations of the Second Order for the year 1876.

33B. Meteorological Observations at Stations of the Second Order for the year 1877.

34. Contributions to our Knowledge of the Meteorology of the Arctic Regions.—Vol. I. Part I., 2*s.*; Part II., 10*s.*; Part III., 6*s.*; Part IV., 5*s.*; Part V., 6*s.*

35. Report of the Meteorological Council for 1877–8. 1*s.*

36. Report of the Proceedings of the Second International Meteorological Congress at Rome, 1879. 1*s.* 6*d.*

37. Report on the Meteorology of Kerguelen Island. By Rev. S. J. Perry, S.J., F.R.S. 3*s.*

38. Report of the Meteorological Council for 1878–9. 5*d.*

39. Meteorological Observations at Stations of the Second Order for the year 1878. 20*s.*

40. Aids to the Study and Forecast of Weather, by W. Clement Ley, M.A. 1*s.*

41. Report of the Meteorological Council for 1879–80. 1*s.*

42. Report of the Meteorological Council for 1880–81. 1*s.* 2*d.*

43. Meteorological Charts for the Ocean District adjacent to the Cape of Good Hope, with accompanying Remarks. Charts, 25*s.*; Remarks, 7*s.*

44. Report on the Gales experienced in the Ocean District adjacent to the Cape of Good Hope, between Lat. 30° and 50° S., and Long. 10° and 40° E., by Capt. H. Toynbee, F.R.A.S. 7*s.* 6*d.*

45. Meteorological Observations at Stations of the Second Order for the year 1879. 20*s.*

46. Report on the Storm of October 13–14, 1881. By Robert H. Scott, F.R.S. 1*s.* 6*d.*

47. Rainfall Tables of the British Isles for 1866–80. Compiled by G. J. Symons, F.R.S. 7*s.* 6*d.*

48. Report of the Meteorological Council for 1881–2. 1*s.*

49. Quarterly Weather Report for 1879. (New Series.) Parts I., II., and III., 6*s.* each; Part IV., 5*s.* 6*d.* Appendices and Plates. 27*s.*

50. Quarterly Weather Report for 1880. (New Series.) Parts I. and II., 6*s.* each; Part III., 4*s.*; Part IV., 6*s.* Appendices and Plates. 28*s.*

* The Observations at Stations of the Second Order for the years 1873–1875 will be found in the Quarterly Weather Report for the respective years.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 51.* Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1881. (New Series.) Part I., 10*s.* 6*d.* Parts II., III., and IV., 21*s.* each.

52. Quarterly Weather Report for 1877. (New Series.) Part I., 10*s.*; Part II., 5*s.*; Part III., 4*s.* 6*d.*; Part IV., 6*s.* Appendices and Plates. 27*s.*

53. Meteorological Atlas of the British Isles. 5*s.* 6*d.*

54. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1882. Parts I. and II., 20*s.* each; Part III., 22*s.* 6*d.*; Part IV., 26*s.*

55. Quarterly Weather Report for 1878. (New Series.) Parts I., II., III., and IV., 6*s.* each. Appendices and Plates. 28*s.*

56. Sunshine Records of the United Kingdom for 1881. 4*s.*

57. Meteorological Observations at Stations of the Second Order for the year 1880. 34*s.* 6*d.*

58. Report of the Meteorological Council for 1882–3. 10½*d.*

59. Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans. 21*s.*

60. Principles of Forecasting by means of Weather Charts. By the Hon. Ralph Abercromby, F.R.Met.Soc. (Second edition, revised.) 2*s.*

61. A Barometer Manual for the Use of Seamen. (Second edition.) 1*s.* 3*d.*

62. Monthly Weather Reports for 1884. Jan., Feb., March, May —Nov., 1*s.* 6*d.* each. April (with 2 Appendices), 2*s.* 6*d.* Dec., 1*s.* 9*d.*

63. Hourly Readings from the Self-Recording Instruments at the Seven Observatories under the Meteorological Council, 1883. Parts I., II., and III., 21*s.* each; Part IV., 30*s.*

64. Report of the Meteorological Council for 1883–4. 1*s.* 2*d.*

65. Monthly Weather Reports for 1885. Jan. to Dec., 1*s.* 6*d.* each.

66. Meteorological Observations at Stations of the Second Order for the year 1881. 35*s.*

67. Report of the Meteorological Council for 1884–5. 4*s.* 4*d.*

68. Monthly Weather Reports for 1886. Jan. to Dec., 1*s.* 6*d.* each.

69. Meteorological Observations at Stations of the Second Order for the year 1882. 35*s.*

70. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1884. Part I., 12*s.*; Part II., 10*s.*; Part III., 10*s.* 6*d.*; Part IV., 15*s.*

71. Synchronous Weather Charts of the North Atlantic and the adjacent Continents. Aug. 1, 1882, to Sept. 3, 1883. Parts I. to IV. (33 sheets each.) 17*s.* each.

72. Report of the Meteorological Council for 1885–86. 8*d.*

73. Meteorological Observations at Stations of the Second Order for the year 1883. 30*s.*

74. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1885. Parts I. and II., 11*s.* each; Part III., 10*s.* 6*d.* Part IV., 12*s.*

* For the years 1874–1880 the Hourly Readings were issued in lithographed form. Price 20*s.* per annum.

LIST OF PUBLICATIONS, &c.—*continued.*

No. 75. Report of the Meteorological Council for 1886–87. 8*d.*

76. Charts showing the Mean Barometric Pressure over the Atlantic, Indian, and Pacific Oceans. 10*s.* 6*d.* Supplementary Chart, 6*d.*

*77. Monthly Weather Reports for 1887. January to April, 1*s.* 6*d.* each. May to December, in wrapper, 12*s.*

78. Meteorological Observations at Stations of the Second Order for the year 1884. 32*s.*

79. Report of the Meteorological Council for 1887–88. 1*s.*

80. Daily Weather Charts for the period of six weeks ending June 25, 1885, to illustrate the tracks of two cyclones in the Arabian Sea. 10*s.*

81. Hourly Readings from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1886. Parts I., II., and III., 10*s.* 6*d.* each. Part IV., 12*s.* 6*d.*

82. Meteorological Observations at Stations of the Second Order for the year 1885. 31*s.*

83. Meteorological Observations at the Foreign and Colonial Stations of the Royal Engineers and the Army Medical Department. 1852–1886. 23*s.*

84. Report of the Meteorological Council for 1888–89. 5½*d.*

†85. Weekly Weather Report for the year 1888. Vol. V. Second Series. 4*d.* per week. With Appendices and Monthly Supplements, priced separately.

86. Weekly Weather Report for the year 1889. Vol. VI. Second Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

87. Weekly Weather Report for the year 1890. Vol. VII. Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately.

88. Meteorological Observations at Stations of the Second Order for the year 1886. 25*s.*

89. Meteorological Observations made at Sanchez, Samaná Bay, St. Domingo. 1886–88. By the late W. Reid, M.D. 8*s.* 6*d.*

90. Cyclone Tracks in the South Indian Ocean. From information compiled by Dr. Meldrum, C.M.G., F.R.S. 7*s.*

91. Report of the Meteorological Council for 1889–90. 7½*d.*

92. Meteorological Charts of the portion of the Indian Ocean adjacent to Cape Guardafui and Ras Hafún. 6*s.*

93. Harmonic Analysis of Hourly Observations of Air Temperature and of Pressure at British Observatories. 12*s.*

94. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1887. 16*s.*

95. Meteorological Observations at Stations of the Second Order for the year 1887. 24*s.*

96. Weekly Weather Report for the year 1891. Vol. VIII., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual subscription, including Supplements and Appendices, post paid 30*s.*

---

* Publication continued after this year as a Supplement to the Weekly Weather Report.

† The publication of the Weekly Weather Report began in February 1878, Annual subscription, 1878–1883, 12*s.* 6*d.*; 1884–1887, 21*s.* 2*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 97. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1888. 20*s.*

98. Ten Years Sunshine in the British Isles, 1881–90. 2*s.*

99. Report of the Meteorological Council for 1890–91. 5½*d.*

100. Weekly Weather Report for the year 1892. Vol. IX., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, Post paid, 30*s.*

101. Meteorological Observations at Stations of the Second Order for the year 1888. 22*s.*

102. Report of the International Meteorological Conference at Munich in 1891. 1*s.* 6*d.*

103. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1889. 15*s.*

104. Report of the Meteorological Council for 1891–92. 6*d.*

105. Hourly Means of the Readings obtained from the Self-Recording Instruments at the Four Observatories under the Meteorological Council, 1890. 20*s.*

106. Wind and Current Charts of the Red Sea. (In the Press.)

107. Weekly Weather Report for the year 1893. Vol. X., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

108. Meteorological Observations at Stations of the Second Order for the year 1889. 34*s.*

109. Report of the Meteorological Council for 1892–93. 8*d.*

110. Meteorological Observations at Stations of the Second Order for the year 1890. 34*s.*

111. Weekly Weather Report for the year 1894. Vol. XI., Third Series. 6*d.* per week. With Appendices and Monthly Supplements, priced separately. Annual Subscription, including Supplements and Appendices, post paid, 30*s.*

112. Report of the Meteorological Council for 1893–94.

113. Hourly Means of the Readings obtained from the Self-recording Instruments at the Five Observatories under the Meteorological Council, 1891. (In the Press.)

114. Rainfall Tables of the British Isles for 1881–90. (In the Press.)

NON-OFFICIAL.

No. 1. Report of an Inquiry into the Connexion between Strong Winds and Barometrical Differences.—By Robert H. Scott, Director of the Office. 6*d.*

2. Report to the Committee of the Meteorological Office on the Meteorology of the North Atlantic.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

3. Report to the Committee of the Meteorological Office on the Use of Isobaric Curves.—By Captain H. Toynbee, F.R.A.S., Marine Superintendent. 1*s.*

4. Routes for Steamers from Aden to the Straits of Sunda and back. Translated from a Paper issued by the Royal Meteorological Institute of the Netherlands. 6*d.*

LIST OF PUBLICATIONS, &c.—*continued.*

No. 5. On the Winds, &c. of the North Atlantic along the Tracks of Steamers from the Channel to New York. Translated from a Paper issued by the Deutsche Seewarte, Hamburg. 6*d.*

6. Report of the Proceedings of the Meteorological Conference at Leipzig. 1872. 1*s.*

7. Notes on the Form of Cyclones in the Southern Indian Ocean. — By C. Meldrum, M.A., F.R.S. [Out of Print.]

8. Report on Weather Telegraphy and Storm Warnings. Presented to the Meteorological Congress at Vienna. 1873. 6*d.*

9. Report of the Permanent Committee of the First International Meteorological Congress at Vienna for 1874. 1*s.* 6*d.*

10. On the Physical Geography of the part of the Atlantic which lies between 20° N. and 10° S. and extends from 10° to 40° W. A Paper read before the British Association at Bristol, in August 1875.—By Capt. Toynbee, F.R.A.S., F.R.G.S., Marine Superintendent. 1*s.* 6*d.*

11. Report of the Permanent Committee of the First International Congress at Vienna for 1876. With Supplement. 2*s.*

12. Reports to the Permanent Committee of the First International Meteorological Congress at Vienna on Atmospheric Electricity, Maritime Meteorology, and Weather Telegraphy, 1878. 2*s.*

13. Report of the Permanent Committee of the First International Congress at Vienna for 1878. 6*d.*

14. Report of the International Meteorological Committee Meeting at Berne, 1880. 1*s.*

15. Report of the Second Meeting of the International Meteorological Committee, held at Copenhagen, August 1882. 2*s.* 6*d.*

16. Report of the Third Meeting of the International Meteorological Committee, held at Paris, September 1885. 1*s.*

17. Report of the Fourth Meeting of the International Meteorological Committee, held at Zürich, September 1888. 4*d.*

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TWELFTH REPORT

OF THE

COMPTROLLER GENERAL.

In pursuance of the requirements of the 102nd Section of the Patents, Designs, and Trade Marks Act, 1883 (46 and 47 Vict., c. 57), I have the honour to report as follows upon the proceedings which took place in the year 1894 under the Patents, &c. Acts, 1883–1888.

The general business of the office, as compared with that of previous years, is exhibited in the subjoined statement.

TOTAL NUMBER OF APPLICATIONS FOR PATENTS, DESIGNS, AND TRADE MARKS AND AMOUNT OF GROSS RECEIPTS AND EXPENDITURE IN EACH YEAR, FROM 1884 to 1894 INCLUSIVE.

Years.	Patents.	Designs.		Trade Marks.	Gross Receipts.	Gross Expenditure.
		Single.	Sets.			
	No.	No.	No.	No.	£	£
1884	17,110	19,515	238	7,104	103,827	64,123
1885	16,101	20,388	337	8,026	88,509	77,739
1886	17,176	23,717	324	10,677	106,754	*109,567
1887	18,051	25,734	309	10,586	124,279	81,577
1888	19,103	25,923	316	13,315	149,623	83,924
1889	21,009	24,370	335	11,316	172,820	79,286
1890	21,307	22,235	318	10,258	192,606	83,240
1891	22,888	21,673	277	10,787	203,520	*103,180
1892	24,169	19,269	258	9,101	199,859	*96,822
1893	25,116	19,174	306	8,675	174,878†	*95,103
1894	25,386	21,230	1,025	8,013	181,855	*96,092

* Including expenditure on account of new offices and buildings.

† The diminution in the Gross Receipts was caused by a reduction in the amount of renewal fees.

P 11813—750—4/95 Wt 1611 D & S.

PATENTS.

THE following TABLE shows the NUMBER of APPLICATIONS for PATENTS from PERSONS residing in the UNITED KINGDOM, and in various COUNTRIES and COLONIES, in each of the Years 1884–94, inclusive :—

From persons resident in	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
UNITED KINGDOM :—											
England and Wales	12,356	11,254	12,049	12,618	13,598	14,599	14,003	15,484	16,272	17,072	17,319
Scotland	901	905	972	916	946	1,030	1,605	1,177	1,260	1,280	1,307
Ireland	254	208	232	257	281	362	361	356	363	575	507
Channel Islands	—	12	6	9	18	22	26	10	18	18	28
Isle of Man	—	6	6	5	8	7	8	10	12	8	18
BRITISH COLONIES AND POSSESSIONS: —											
Australia : -											
New South Wales	14	15	18	24	38	61	57	39	52	34	41
Queensland	1	—	2	6	2	2	7	9	7	6	19
South Australia	4	5	2	10	20	10	11	10	7	11	12
Victoria	19	22	25	30	58	44	68	79	65	85	79
West Australia	—	—	—	1	—	—	2	2	—	2	2
Bermuda	—	—	—	—	—	1	—	—	—	—	1
British Burmah	2	—	—	1	1	4	4	1	3	—	—
British Guiana	1	1	—	—	4	2	1	2	2	—	1
British Honduras	—	—	—	—	1	—	—	—	—	—	—
Canada	63	80	128	97	99	100	120	135	137	134	141
Cape of Good Hope	7	10	3	2	2	4	2	7	19	14	8
Ceylon	—	1	6	2	3	4	12	6	1	6	5
Fiji	—	1	—	—	—	—	—	1	—	—	—
Gibraltar	2	2	—	—	1	1	2	3	1	3	—
Hong Kong	—	—	—	—	—	—	—	—	1	1	4
India	40	26	38	28	51	43	30	63	51	62	55
Malta	—	—	—	—	5	—	1	—	3	1	—
Mauritius	—	1	—	2	—	—	2	—	2	—	—
Natal	3	—	1	—	—	4	3	8	2	10	2
Newfoundland	2	5	2	1	2	1	1	—	—	2	—
New Zealand	16	25	31	38	47	55	48	53	52	61	60
St. Helena	—	—	—	—	—	1	—	—	—	—	—
Straits Settlements	—	2	—	1	3	1	4	1	2	3	3
Tasmania	—	1	2	—	—	1	1	—	2	2	6
West Indies	6	5	9	4	5	8	7	6	9	16	6
FOREIGN STATES : —											
EUROPE—											
Austria	151	156	146	165	184	212	237	247	259	261	278
Belgium	114	121	144	137	155	126	123	116	152	165	191
Bulgaria	—	—	—	—	—	—	1	—	—	1	—
Denmark	25	24	20	35	41	55	32	36	27	41	46
France	788	701	728	762	702	677	772	793	847	866	799
Germany	890	869	871	961	1,031	1,336	1,336	1,466	1,791	1,864	1,945
Greece	—	—	—	—	—	1	2	—	—	1	3
Holland	31	29	22	33	29	26	33	41	45	41	51
Italy	39	38	40	31	29	46	45	48	78	50	71
Norway	8	7	11	7	19	15	23	22	22	19	16
Portugal	2	—	6	2	3	4	6	4	1	1	2
Roumania	—	—	1	—	1	2	4	7	5	4	2
Russia	38	41	30	35	35	53	57	58	52	49	61
Servia	—	—	—	—	—	—	1	2	5	—	—
Spain	17	23	25	21	37	27	42	28	22	22	25
Sweden	42	41	40	47	31	41	44	53	50	60	85
Switzerland	67	56	68	76	117	104	120	78	96	100	91
Turkey	4	2	5	7	8	4	2	3	1	2	8
ASIA—											
Asia Minor	1	—	1	—	—	3	1	2	2	3	3
China	—	3	2	1	2	6	1	2	4	4	6
Japan	2	1	1	5	2	2	4	5	4	4	1
Malay Peninsula	—	—	—	—	—	1	—	—	—	—	—
Persia	—	—	—	—	—	1	—	—	—	1	—
Siam	—	—	—	—	1	6	1	2	2	1	—
Sunda Islands	—	—	2	1	2	2	1	2	—	—	—
AFRICA—											
Algeria	3	4	—	2	3	3	—	—	2	1	1
Canary Islands	—	—	—	—	—	1	1	1	—	—	1
Egypt	3	4	3	3	3	—	2	3	5	5	7
South Africa	—	—	8	5	9	11	11	5	21	36	19
West Africa	—	—	—	1	—	—	—	—	—	—	—
Madeira	—	—	—	1	—	—	—	—	—	—	—
Réunion	—	—	—	—	—	—	—	1	—	—	—
AMERICA—											
Argentine Republic	2	2	4	1	1	4	6	9	8	7	12
Brazil	7	4	5	14	4	8	6	13	4	1	3
Central America	1	2	2	2	2	1	2	2	—	3	—
Mexico	1	—	—	1	1	3	1	3	10	5	
South America (undefined)	2	6	10	1	—	2	6	9	2	9	
United States	1,181	1,382	1,447	1,632	1,457	1,857	2,597	2,364	2,308	2,082	2,017
SANDWICH ISLANDS	—	—	2	1	1	1	1	1	1	1	—
NEW CALEDONIA	—	—	—	—	—	1	—	—	—	—	—
Total applications	17,110	16,101	17,176	18,051	19,103	21,009	21,307	22,888	24,169	25,116	25,386

Patents—*continued.*

Applications in 1894.

Although the number of applications for patents in the year 1894 continued upon an ascending scale, being 270 above that of the previous year, this increase was considerably less than that of the normal average of the preceding seven years. It will, however, be seen, by a glance at the foregoing table, that the number of applications for patents has more or less annually increased from 17,176 in the year 1886 to 25,386 in 1894, being at the rate of 48 per cent.

It is interesting to notice a large increase in the number of applications for patents from Ireland in 1894 as well as in 1893, whilst amongst the Colonies the largest proportionate advance is shown by Queensland. As respects similar applications from Foreign States, Belgium, Germany, and Sweden show the largest increase, the number of applications from France having remained curiously stationary during the past ten years, being 788 in the year 1884 and only 799 in 1894. The applications from the United States of America, which reached the number of 2,597 in 1890, have fallen off since that date, and amounted only to 2,017 in 1894.

Of the 25,386 applications received in the year 1894, 501, or two per cent., were made by women, about 100 being inventions connected with articles of dress.

Number of applications and of patents remaining in force.

Tabular statements of the relative proportions of provisional and complete specifications filed during the year are given in Appendix G.; others, exhibiting the number of applications and the number of patents remaining in force in each year under the Acts of 1852 and 1883, will be found in Appendices E. and F.; whilst Appendices H., H[1]., and I., I[1]. show the effect of renewal fees upon the duration of patents.

The reduction in the scale of renewal fees, which took place in 1892, resulted in a diminution of receipts from this source, amounting in the year 1894 to £23,365, a sum, however, less than that in 1893, which amounted to £30,129.

International Union.

The number of applications for patents in this country received from inventors residing in other states of the Union, under the provisions of the International Convention of 1883, amounted to 179.

During the year Denmark joined the International Union.

Applications for amendments of specifications.

112 applications for amendments of specifications before the sealing of the patent and 72 applications for amendments after sealing were received during the year.

Hearings by Comptroller.

The number and results of the hearings before the Comptroller during the year in respect of oppositions to the grant of patents and to proposed amendments of specifications, as well as of those in connection with the exercise of the discretionary power conferred upon the Comptroller by Section 94 of the Act, are set forth in Appendix J.

Appeals to the Law Officer.

The number and results of the appeals to the Law Officer from the decisions of the Comptroller will also be found in the same Appendix.

Applications to the Privy Council.

Five applications were made to the Privy Council in 1894 for extensions of the terms of patents; of these, two patents were extended for five years, one for seven years, one application was withdrawn, and one case was not decided at the end of the year.

Free library. Hours on Week-days—10 a.m. to 10 p.m.

The number of readers frequenting the Patent Office Library during the year showed an advance upon that of the previous year, 113,374 persons having availed themselves of its use. The lighting of the library has recently been improved by the employment of incandescent gas burners.

New Patent Office.

The construction of the new Warehouse and Sale Branch adjoining the main building, mentioned in my last Report, was completed by the end of the year. This building contains room for about six miles of shelving, as well as a photographic studio for the reproduction of the drawings attached to specifications of patents. A new block is now in course of construction on the south side of Staple Inn.

Publications.

Reports of 73 patent cases tried in courts of law in the United Kingdom during 1894 were published in accordance with the requirement of Section 40 (1) of the Act; as well as 15 reports of trade mark cases, and 4 reports of design cases.

Abridgments of Specifications.

A list of the classified abridgments of specifications of patents published during the year is given in Appendix N.

Letters, &c.

Some interest may attach to a record of the number of letters and other communications despatched by post from the office, which in the course of 1894 amounted to about 160,000, the number of parcels of publications from the Sale Branch amounting to about 80,000.

Sale of Publications.

The receipts in cash from the sale of official publications during 1894 amounted to £6,210 1*s.* 9*d.*, which sum was paid over to the Stationery Office.

Donations.

A list of public institutions and public offices receiving free grants of Patent Office publications is given in Appendix O.

Receipts and expenditure.

A balance sheet of total receipts and expenditure is given in Appendix A., and statements of the various receipts on account of patents, and of the amounts paid for salaries and allowances, as required by Section 102 of the Act, are printed in Appendices B., C. and D.

Register of Patent Agents.

The names of eleven gentlemen were added to the Register of Patent Agents during the year, the total number of agents upon the register on the 31st December 1894 numbering 236.

DESIGNS.

Number of designs applied for.

The number of designs applied for during the year amounted to 21,230, exclusive of 1,025 "sets" of designs. In the previous year, 19,174 single designs, and 306 "sets" were applied for. The term "set" includes any number of articles ordinarily on sale together, irrespective of the varieties of the size or arrangement in which the particular design may be shown on each separate article.

Number applied for in each class, and receipts therefrom.

The number of designs applied for in each class during the year, and the amount of fees received in respect thereof, will be found in Appendix K.

Number of similar designs refused.

Four hundred and ninety designs were refused registration during 1894 on account of their similarity to designs already registered.

Objections.

During the year, 1,606 applications for registration of designs (including the above-mentioned 490) were objected to by the Comptroller. The objections, other than those on account of similarity to designs already registered, were chiefly on account of want of subject-matter or want of substantial novelty.

DESIGNS—*continued.*

Hearings by the Comptroller under Section 94.

Of the 1,606 cases objected to, the applicants in 1,305 cases acquiesced in the objections raised by the Comptroller without applying for a hearing. As regards the 301 others, 233 were accorded hearings with the following results:—83 applications were accepted without alteration; 103 were refused; and 47 were accepted, subject to modification. The remaining 68 applications were allowed, after correspondence, to proceed.

Lace Designs.

The operation of the Lace Designs Rules, 1893, which reduced the scale of fees for Lace Designs, has been carefully watched; and I am glad to be able to report a very large increase in the number of registrations of Lace Designs during the year 1894. It is anticipated that the operation of this reduced scale of fees will be found very beneficial to the Lace Trade; but I cannot as yet report that the increase in the number of the Designs applied for has been sufficiently large to recoup the Office for the reduction in the fees, though the actual loss has not been very heavy.

TRADE MARKS.

Applications.

The total number of applications for the registration of trade marks during the year (including 143* applications to the Cutlers' Company of Sheffield) was 8,013, as compared with 8,675 applications in the previous year.

Trade Marks advertised and registered.

During the same period 2,970 trade marks were advertised and 2,905 trade marks were registered. A table showing the number of trade marks advertised and the number registered in each of the 50 different classes in 1894, and in each of the two preceding years, and also the total number of marks advertised and registered in each class since the 1st of January 1876, is printed in Appendix L.

Hearings under Section 94.

1,703 hearings under Section 94 took place during the year.

Oppositions under Section 69.

One hundred and nineteen notices of opposition to the registration of trade marks were lodged during the year 1894. Fifty-eight cases of opposition were heard during the year under Section 69. In four of these there were appeals to the Board of Trade, all of which appeals were referred by the Board to the Court. In one of the cases referred, the appeal was abandoned; in one case the Comptroller's decision was reversed; and the other two cases still remain undecided.

Appeals to Board of Trade under Section 62.

During the year there were 41 appeals to the Board of Trade from decisions of the Comptroller under Section 62. Of these, 3 were withdrawn, or not duly prosecuted by the Appellants, 24 were heard by the Board of Trade, and 14 were referred by the Board to the Court. Of the 24 appeals heard by the Board, 10 were allowed, 13 were dismissed, and 1 was allowed on the fulfilment of certain conditions. Of the 14 appeals referred by the Board to the Court, 2 were abandoned by the Appellants, 1 was allowed on the fulfilment of certain conditions, 1 was dismissed, and 10 remain undecided.

Receipts from Trade Marks.

The total receipts from various sources on account of trade marks in the year 1894, amounted to £8,092 16*s.* 10*d.*, including the sum of £1,355 0*s.* 0*d.* on account of renewal fees. *See* Appendix M.

All which I have the honour most humbly to report.

H. READER LACK,
Comptroller.

The Patent Office,
20th May, 1895.

* Of this number, 33 were in respect of Old Corporate Marks, for which no fee is charged.

APPENDICES.

APPENDIX A.

BALANCE SHEET of INCOME and EXPENDITURE for the Year ended 31st December 1894.

RECEIPTS.	£	s.	d.	PAYMENTS.	£	s.	d.
Patent Fees. (*See* Appendix D.)	163,447	6	4½	Salaries, &c. (*See* Appendix B.)	55,002	13	8
				Pensions	2,110	0	0
				Compensations	1,150	0	0
				Current and Incidental expenses. (*See* Appendix C.)	2,469	1	10
Designs Fees. (*See* Appendix K.)	4,104	10	0	Cost of Stationery supplied by Her Majesty's Stationery Office, books for the Free Library, and binding, &c.	3,000	0	0
Trade Marks Fees. (*See* Appendix M.)	8,092	16	10	Messrs. Darling and Son for printing specifications of patents, indexes, &c., and lithographer's bills for drawings accompanying specifications; and miscellaneous printing	19,800	0	0
Sale of Publications	6,210	1	9	Cost of paper supplied to the printer and lithographer by Her Majesty's Stationery Office	1,500	0	0
				Rent of offices, rates, taxes, and insurance	1,110	0	0
				New works, &c.	8,620	0	0
				Cost of coals and other fuel supplied to the Patent Office by Her Majesty's Office of Works, and furniture and repairs	1,330	0	0
					96,091	15	6
				Surplus for the Year 1894	85,762	19	5½
	£181,854	14	11½		181,854	14	11½

APPENDIX B.

STATEMENT showing the LIST of the STAFF and AMOUNTS PAID ON ACCOUNT of SALARIES, &c., 1st January to 31st December 1894.

List of Staff.	Amount of Salaries for the Year 1894.		
	£	s.	d.
Comptroller General	1,500	0	0
Registrar of Designs and Trade Marks	1,000	0	0
Chief Examiner	818	5	6
Four Principals	2,400	0	0
Librarian	520	17	7
Superintendent of Publications and Assistant Librarian	671	1	2
Superintendent of Store Branch	500	0	0
Clerk of Trade Marks Register	450	0	0
Three Staff Clerks Trade Marks	1,037	18	0
Three Examiners	1,784	12	5
Fifty-two Assistant Examiners	20,312	17	7
Eight Second-class Clerks	3,430	0	0
One Third-class Clerk	295	1	1
One Higher Division Clerk	330	12	9
Forty Second Division Clerks	7,040	5	9
One Law Clerk	375	0	0
Index Clerk	221	12	9
One Extra Clerk	225	0	0
Compositor of Trade Marks Journal	265	0	0
Two Sorters of Designs	347	4	6
Two Custodians in Library	340	6	2
Record Keeper	170	1	1
Twenty-one Abstractors	2,086	16	1
,, ,, (overtime)	271	14	11
Draftsman	156	0	0
Office Keeper	166	16	2
Designs Messenger and Sealer	130	0	0
Twenty-six Attendants, Messengers, and Warehousemen	2,327	4	11
Fireman	93	12	0
Temporary Fireman	45	1	6
Copyists	2,961	3	7
Temporary Messengers	120	17	5
Charwomen	624	0	0
Results Pay to Examining Staff	266	5	0
Index to Official Journal	123	16	3
Manchester Branch (Trade Marks Registry)—			
Keeper of Cotton Marks	600	0	0
Assistant Keeper of Cotton Marks	274	16	9
Registration and Consent Clerk	144	16	1
Two Sorters (Permanent)	215	11	10
Sorters (Temporary)	332	4	10
Cleaning offices	26	0	0
	£55,002	13	8

APPENDIX C.

Current and Incidental Expenses.

	£	s.	d.
Police	432	6	6
Shorthand Writers' Notes:—			
For Patents, Designs, and Trade Marks Reports	655	12	8
„ Hearings before Law Officers and Comptroller	542	10	4
International Bureau	139	4	0
Travelling Expenses	21	0	2
Incidentals	678	8	2
	£2,469	1	10

APPENDIX D.

PATENTS BRANCH.

Account of Fees Received from the 1st January to 31st December 1894.

Description of Documents, &c.	Number.	Fees.	Amount Received.		
		Each.	£	s.	d.
Application for Patents.—(21,374 with Provisional Specification, and 4,012 with Complete Specification)	25,386	1*l.*	25,386	0	0
Complete Specification.—(In the first instance, 4,012; filed after Provisional, 7,979)	11,991	3*l.*	35,973	0	0
Entries of Assignments, Licenses, &c.	1,594	10*s.*	797	0	0
Applications to amend Specification: before sealing	112	1*l.* 10*s.*	168	0	0
„ „ after „	72	3*l.*	216	0	0
Certificates of Comptroller	282	5*s.*	70	10	0
Notices of Opposition to Grant of Patent	196	10*s.*	98	0	0
„ „ Amendment of Specification	7	10*s.*	3	10	0
Hearings before Comptroller.—(Opposition to Grants and Amendments.)—(Hearing Fees)	279	1*l.*	279	0	0
Appeal to Law Officers	41	3*l.*	123	0	0
Requests to Comptroller to correct clerical errors: before sealing	58	5*s.*	14	10	0
„ „ „ after „	12	1*l.*	12	0	0
Application for Duplicate of Patent	6	2*l.*	12	0	0
„ for 1 month's enlargement of time for payment of Renewal Fee	441	1*l.*	441	0	0
„ 2 „ „ „ „ „	115	3*l.*	345	0	0
„ 3 „ „ „ „ „	201	5*l.*	1,005	0	0
Notices of intended exhibition of Unpatented Inventions	5	10*s.*	2	10	0
Searches	2,260	1*s.*	113	0	0
Postal requests for printed copies of Specifications	17,183	7½*d.*	536	19	4½
Folios of Office Copies of Documents	7,893	4*d.*	131	11	0
Certificates on Office Copies	456	1*s.*	22	16	0
Annual Instalments for continuing the Patent in force:—					
In respect of the fifth year	3,171	5*l.*	15,855	0	0
„ „ sixth year	2,398	6*l.*	14,388	0	0
„ „ seventh year	1,765	7*l.*	12,355	0	0
„ „ eighth year	1,411	8*l.*	11,288	0	0
„ „ ninth year	1,154	9*l.*	10,386	0	0
„ „ tenth year	998	10*l.*	9,980	0	0
„ „ eleventh year	840	11*l.*	9,240	0	0
„ „ twelfth year	391	12*l.*	4,692	0	0
„ „ thirteenth year	306	13*l.*	3,978	0	0
„ „ fourteenth year	247	14*l.*	3,458	0	0
Application for 1 month's enlargement of time for filing Complete Specification	794	2*l.*	1,588	0	0
„ 1 „ „ „ accepting Complete Specification.	193	2*l.*	386	0	0
„ 2 „ „ „ „ „	16	4*l.*	64	0	0
„ 3 „ „ „ „ „	6	6*l.*	36	0	0
„ for prolongation of Patent	6	10*s.*	3	0	0
			£163,447	6	4½

APPENDIX E.

NUMBER of APPLICATIONS for PATENTS, PATENTS SEALED, &c., under Act of 1852.

Years.	No. of Applications for Patents.	No. of Patents sealed thereon.	No. of such Patents void for want of Final Specifications.	No. of such Patents remaining in force to end of		
				3rd Year, or in case of Patents subsequent to 1880 to end of 4th Year.	7th Year.	14th Year.
1852	1,211	914	23	891	310	102
1853	3,045	2,187	74	2,113	621	205
1854	2,764	1,878	66	1,812	513	140
1855	2,958	2,046	52	1,994	551	195
1856	3,106	2,094	47	2,047	573	214
1857	3,200	2,028	52	1,976	584	221
1858	3,007	1,954	31	1,923	540	197
1859	3,000	1,977	39	1,938	542	217
1860	3,196	2,063	47	2,016	579	194
1861	3,276	2,047	35	2,012	575	179
1862	3,490	2,191	35	2,156	646	214
1863	3,309	2,094	28	2,066	632	215
1864	3,260	2,024	22	2,002	550	178
1865	3,386	2,186	27	2,159	582	193
1866	3,453	2,124	24	2,100	574	227
1867	3,723	2,284	31	2,253	619	260
1868	3,991	2,490	34	2,456	729	272
1869	3,786	2,407	41	2,366	793	309
1870	3,405	2,180	40	2,140	738	280
1871	3,529	2,376	38	2,338	819	307
1872	3,970	2,771	37	2,734	853	291
1873	4,294	2,974	68	2,906	856	281
1874	4,492	3,162	58	3,104	953	301
1875	4,561	3,112	63	3,049	895	295
1876	5,069	3,435	68	3,367	947	341
1877	4,949	3,317	58	3,259		
1878	5,343	3,509	71	3,438		
1879	5,338	3,524	60	3,464		
1880	5,517	3,741	67	3,674		
1881	5,751	3,950	68	3,882		
1882	6,241	4,337	77	4,260		
1883	5,993	3,962	64	3,898		

Upon the Patents of 1877 and subsequent years, Annual Renewal Fees became payable. *See* Appendix H.

NOTE.—The total number of Patents for Inventions granted in the United Kingdom between the years 1617 and 1852 was 13,561.

APPENDIX F.

NUMBER of APPLICATIONS for PATENTS, &c., under Act of 1883.

Years.	No. of Applications for Patents.	No. of Applications abandoned. § 8 s.s. 2.	No. of Applications void. § 9 s.s. 4.	No. of Applications open to Inspection under §10, but not proceeded with to the Sealing Stage.	No. of Applications on which Patents were refused. § 11.	No. of Patents Sealed and remaining in force to end of 4th year.
1884	17,110	7,012	63	39	12	9,984
1885	16,101	7,236	58	22	10	8,775
1886	17,176	7,946	79	36	10	9,105
1887	18,051	8,435	76	63	20	9,457
1888	19,103	9,152	77	38	16	9,820
1889	21,009	10,225	90	18	11	10,665
1890	21,307	10,565	100	25	18	10,599
1891	22,888	11,796	122	20	25	10,925
1892	24,169	12,403	122	21	27	11,596
1893	25,116	13,169	121	58	27	11,741
1894	25,386					

APPENDIX G.

Number of Specifications, Provisional and Complete, filed under Act of 1883.

Year.	On application.						Complete Specifications filed after Provisional Specifications.		Total Complete Specifications.		Total Specifications.	
	Provisional Specifications.		Complete Specifications.		Total Specifications.							
	No.	Increase per cent. upon previous year.	No.	Increase per cent. upon previous year.	No.	Increase per cent. upon previous year.	No.	Increase per cent. upon previous year.	No.	Increase per cent. upon previous year.	No.	Increase per cent. upon previous year.
1884	15,253	—	1,857	—	17,110	—	3,613	—	5,470	—	20,723	—
1885	13,997	[— 8·2]	2,104	13·3	16,101	[— 5·9]	6,900	91·0	9,004	64·6	23,001	11·0
1886	14,834	5·9	2,342	11·3	17,176	6.7	6,845	[— 0·8]	9,187	2·0	24,021	4·4
1887	15,491	4·4	2,560	9·3	18,051	5·1	7,002	2·3	9,562	4·1	25,053	4·3
1888	16,422	6·0	2,681	4·7	19,103	5·8	7,098	1·4	9,779	2·3	26,201	4·6
1889	17,754	8·1	3,255	21·4	21,009	10·0	7,332	3·3	10,587	8·3	28,341	8·2
1890	17,899	0·8	3,408	4·7	21,307	1·4	7,266	[— 0·9]	10,674	0·8	28,573	0·8
1891	19,377	8·3	3,511	3·0	22,888	7·4	7,555	4·0	11,066	3·7	30,443	6·6
1892	20,322	4·9	3,847	9·6	24,169	5·6	7,615	0·8	11,462	3·6	31,784	4·4
1893	21,193	4·3	3,923	2·0	25,116	3·9	7,980	4·8	11,903	3·8	33,096	4·0
1894	21,374	0·9	4,012	2·2	25,386	1·1	7,979	0·0	11,991	0·7	33,365	0·8
Average yearly increase from 1886.	820	4·8	212	7·6	1,032	5·2	119	1·6	331	3·2	1,151	4·2

APPENDIX H.

Number of Patents kept in force by Payment of Renewal Fees.

YEAR.	No. of Patents remaining in force to end of 3rd year, or in the case of Patents subsequent to 1880, to end of 4th year.	NUMBER KEPT IN FORCE TO END OF												
		7th year, or in the case of Patents subsequent to 1883, 8th year, £50.	14th year, £100.	5th year.	6th year.	7th year.	8th year.	9th year.	10th year.	11th year.	12th year.	13th year.	14th year.	YEAR.
(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)	(15.)
1877	3,259	981	*250	...	...	...	214	170	152	127	106	86	70	1877
1878	3,438	1,113	35	...	...	...	567	457	411	341	294	244	192	1878
1879	3,464	1,108	23	...	...	...	574	487	427	355	316	231	175	1879
1880	3,674	1,174	22	...	...	...	628	531	459	391	340	281	222	1880
1881	3,882	96	12	1,259	959	782	741	617	516	417	354	291	237	1881
1882	4,260	52	12	1,419	1,090	904	772	629	539	441	357	294	...	1882
1883	3,898	35	3	1,420	1,076	862	758	621	509	429	362	...	...	1883
1884	9,984	32	1	2,889	2,105	1,714	1,421	1,172	1,001	856	...	...	...	1884
1885	8,775	40	...	2,645	2,009	1,610	1,341	1,162	981	...	...	...	...	1885
1886	9,105	19	...	2,705	2,051	1,657	1,381	1,152	...	...	...	...	...	1886
1887	9,457	13	...	2,809	2,098	1,702	1,390	...	...	...	...	...	...	1887
1888	9,820	4	...	2,836	2,178	1,748	...	...	...	...	...	...	...	1888
1889	10,665	...	...	3,369	2,381	...	...	...	...	...	...	...	...	1889
1890	10,599	...	...	3,162	...	...	...	...	...	...	...	...	...	1890
1891	10,925	...	...	...	...	...	...	...	...	...	...	...	...	1891
1892	11,596	...	...	...	...	...	...	...	...	...	...	...	...	1892
1893	11,741	...	...	...	...	...	...	...	...	...	...	...	...	1893

* The provision allowing the £100 fee to be paid in yearly instalments did not apply to the earlier numbers of the year 1877.

APPENDIX H[1].

Percentage of Patents kept in Force by Payment of Renewal Fees.

YEAR.	Number, per 100 applications, of Patents sealed and in force for 3 or 4 years (Col. 2 of Appendix H.).	NUMBER, PER 100 SEALED PATENTS IN FORCE FOR 3 OR 4 YEARS, OF PATENTS KEPT IN FORCE TO END OF												YEAR.
		7th or 8th year (Col. 3 of App. H.).	14th year (Col. 4 of App. H).	5th year (Cols. 3 and 5 of App. H.).	6th year (Cols. 3 and 6 of App. H.).	7th year (Cols. 3 and 7 of App. H.).	8th year (Cols. 4 and 8 of App. H.).	9th year (Cols. 4 and 9 of App. H.).	10th year (Cols. 4 and 10 of App. H.).	11th year (Cols. 4 and 11 of App. H.).	12th year (Cols. 4 and 12 of App. H.).	13th year (Cols. 4 and 13 of App. H.).	14th year (Cols. 4 and 14 of App. H.).	
(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)	(15.)
1877	65·8	30·1	...	...	...	...	14·2	12·8	12·3	11·6	10·9	10·3	9·8	1877
1878	64·3	32·4	...	...	...	...	17·5	14·3	13·0	10·9	9·6	8·1	6·6	1878
1879	64·9	32·0	...	...	...	...	17·2	14·7	13·0	10·9	9·8	7·3	5·7	1879
1880	66·6	32·0	...	...	...	...	17·7	15·1	13·1	11·2	9·9	8·2	6·6	1880
1881	67·5	...	...	34·9	27·2	22·6	19·4	16·2	13·6	11·1	9·4	7·8	6·4	1881
1882	68·3	...	...	34·5	26·8	22·4	18·4	15·0	12·9	10·6	8·7	7·2	...	1882
1883	65·0	...	...	37·3	28·5	23·0	19·5	16·0	13·1	11·1	9·4	...	...	1883
1884	58·3	...	...	29·2	21·4	17·5	14·6	11·7	10·0	8·6	...	...	...	1884
1885	54·4	...	...	30·6	23·4	18·8	15·7	13·2	11·2	...	...	...	...	1885
1886	53·0	...	...	29·9	22·7	18·4	15·4	12·7	...	...	...	...	...	1886
1887	52·4	...	...	29·8	22·3	18·1	14·8	...	...	...	...	...	...	1887
1888	51·4	...	...	28·9	22.2	17·8	...	...	...	...	...	...	...	1888
1889	50·8	...	...	31·6	22·3	...	...	...	...	...	...	...	...	1889
1890	49·7	...	...	29·8	...	...	...	...	...	...	...	...	...	1890
1891	47·7	...	...	...	...	...	...	...	...	...	...	...	...	1891
1892	48·0	...	...	...	...	...	...	...	...	...	...	...	...	1892
1893	46·7	...	...	...	...	...	...	...	...	...	...	...	...	1893

APPENDIX I.

Number of Patents expired through non-payment of Renewal Fees.

YEAR.	No. of Patents remaining in force to end of 3rd year, or in the case of Patents subsequent to 1880, to end of 4th year.	Number expiring at commencement of											YEAR.
		4th year.	5th year.	6th year.	7th year.	8th year.	9th year.	10th year.	11th year.	12th year.	13th year.	14th year.	
(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
1877	3,259	2,278	...	...	...	517	44	18	25	21	20	16	1877
1878	3,438	2,325	...	...	...	511	110	46	70	47	50	52	1878
1879	3,464	2,356	...	...	...	511	87	60	72	39	85	56	1879
1880	3,674	2,500	...	...	...	524	97	72	68	51	59	59	1880
1881	3,882	...	2,527	300	137	125	124	101	99	63	63	54	1881
1882	4,260	..	2,789	329	186	172	143	90	98	84	63	...	1882
1883	3,898	...	2,443	344	214	136	137	112	80	67	...	...	1883
1884	9,984	...	7,063	784	391	293	280	171	145	...	...	...	1884
1885	8,775	...	6,090	636	399	269	219	181	...	...	...	...	1885
1886	9,105	...	6,381	654	394	276	248	...	...	...	...	...	1886
1887	9,457	...	6,635	711	396	312	...	...	...	...	...	...	1887
1888	9,820	...	6,980	658	430	...	...	...	...	...	...	...	1888
1889	10,665	...	7,296	988	...	...	...	...	...	...	...	...	1889
1890	10,599	...	7,437	...	...	...	...	...	...	...	...	...	1890
1891	10,925	...	...	...	...	...	...	...	...	...	...	...	1891
1892	11,596	...	...	...	...	...	...	...	...	...	...	...	1892
1893	11,741	...	...	...	...	...	...	...	...	...	...	...	1893

APPENDIX I.

PERCENTAGE OF PATENTS EXPIRED THROUGH NON-PAYMENT OF RENEWAL FEES.

YEAR.	Number, per 100 Applications, of Patents Sealed and in force for 3 or 4 years.	Number, per 100 sealed Patents in force for 3 or 4 years, of Patents expiring at commencement of										YEAR.
		4th year.	5th year.	6th year.	7th year.	8th year.	9th year.	10th year.	11th year.	12th year.	13th year.	14th year.	
(1.)	(2.)	(3.)	(4.)	(5.)	(6.)	(7.)	(8.)	(9.)	(10.)	(11.)	(12.)	(13.)	(14.)
1877	65·8	69·9	...	...	...	15·9	1·4	·5	·7	·7	·6	·5	1877
1878	64·3	67·6	...	...	...	14·9	3·2	1·3	2·1	1·3	1·5	1·5	1878
1879	64·9	68·0	...	...	...	14·8	2·5	1·7	2·1	1·1	2·5	1·6	1879
1880	66·6	68·0	...	...	...	14·3	2·6	2·0	1·9	1·3	1·7	1·6	1880
1881	67·5	...	65·1	7·7	4·6	3·2	3·2	2·6	2·5	1·7	1·6	1·4	1881
1882	68·3	...	65·5	7·7	4·4	4·0	3·4	2·1	2·3	1·9	1·5	...	1882
1883	65·0	...	62·7	8·8	5·5	3·5	3·5	2·9	2·0	1·7	...	...	1883
1884	58·3	...	70·8	7·8	3·9	2·9	2·9	1·7	1·4	...	...	...	1884
1885	54·4	...	69·4	7·2	4·6	3·1	2·5	2·0	...	...	...	...	1885
1886	53·0	...	70·1	7·2	4·3	3·0	2·7	...	...	...	...	...	1886
1887	52·4	...	70·2	7·5	4·2	3·3	...	...	...	...	...	...	1887
1888	51·4	...	71·1	6·7	4·4	...	...	...	...	...	...	...	1888
1889	50·8	...	68·4	9·3	...	...	...	...	...	...	...	...	1889
1890	49·7	...	70·2	...	...	...	...	...	...	...	...	...	1890
1891	47·7	...	...	...	...	...	...	...	...	...	...	...	1891
1892	48·0	...	...	...	...	...	...	...	...	...	...	...	1892
1893	46·7	...	...	...	...	...	...	...	...	...	...	...	1893

APPENDIX J.

HEARINGS (Patents only) before the COMPTROLLER GENERAL under Sections 11, 18, and 94 of the PATENTS, DESIGNS, and TRADE MARKS ACT, 1883.

	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894
NUMBER OF HEARINGS UPON OPPOSITIONS TO GRANTS OF PATENTS	7	68	103	95	117	107	132	119	159	136	163
NUMBER OF APPEALS TO LAW OFFICER	2	14	17	15	29	27	23	20	32	26	29
Decision of Comptroller supported	1	9	9	9	14	13	14	13	19	8	6
" " reversed	1	0	1	2	7	4	5	2	3	3	2
" " varied	—	5	7	4	7	7	—	4	6	1	10
Outstanding	—	—	—	—	1	1	1	—	1	8	—
Withdrawn	—	—	—	—	—	2	3	1	2	6	10
Application for Patent abandoned	—	—	—	—	—	—	—	—	1	—	1
NUMBER OF HEARINGS UPON OPPOSITIONS TO AMENDMENTS	9	14	17	8	13	3	8	8	6	12	8
NUMBER OF APPEALS TO LAW OFFICER	3	7	2	3	2	—	2	1	4	2	5
Decision of Comptroller supported	1	4	1	1	2	—	1	—	1	—	2
" " reversed	—	1	1	1	—	—	—	—	—	—	—
" " varied	2	2	—	1	—	—	1	1	2	1	1
Withdrawn	—	—	—	—	—	—	—	—	1	1	2
NUMBER OF HEARINGS UNDER SECTION 94	100	120	110	100	85	75	76	75	72	70	70
NUMBER OF APPEALS TO LAW OFFICER	3	7	8	5	4	9	3	2	2	—	4
Decision of Comptroller supported	2	1	3	2	3	2	1	—	1	—	2
" " reversed	1	3	1	3	—	3	1	—	—	—	—
" " varied	—	3	4	—	1	1	1	2	1	—	—
Not subject to appeal	—	—	—	—	—	3	—	—	—	—	2

APPENDIX K.

DESIGNS BRANCH.

ACCOUNT of FEES RECEIVED from the 1st January to the 31st December 1894.

Classes of Designs, &c.	Number of Applications for Registration.		Fees Charged.		Amount Received.		
	Single Designs.	Sets.	Single Designs.	Sets.	Single Designs.	Sets.	Total.
					£ s. d.	£ s. d.	£ s. d.
1. Articles of Metal (not included in Class 2)	2,622	130	10*s.*	1*l.*	1,311 0 0	130 0 0	1,441 0 0
2. Jewellery	311	4	10*s.*	1*l.*	155 10 0	4 0 0	159 10 0
3. Articles of Wood, Bone, Ivory, Papier-mâché, or other solid substances not included in other Classes	619	13	10*s.*	1*l.*	309 10 0	13 0 0	322 10 0
4. Articles of Glass, Earthenware, or Porcelain, Bricks, Tiles, or Cement	707	150	10*s.*	1*l.*	353 10 0	150 0 0	503 10 0
5. Articles of Paper (except Hangings)	189	5	10*s.*	1*l.*	94 10 0	5 0 0	99 10 0
6. Articles of Leather, including Bookbinding of all materials	94	2	10*s.*	1*l.*	47 0 0	2 0 0	49 0 0
7. Paper-hangings	145	—	10*s.*	—	72 10 0	—	72 10 0
8. Carpets and Rugs in all materials, Floor-cloths and Oil-cloths	290	—	10*s.*	—	145 0 0	—	145 0 0
9. Hosiery	46	—	10*s.*	—	23 0 0	—	23 0 0
9A. Lace	2731	717	1*s.*	2*s.*	136 11 0	71 14 0	208 5 0
10. Millinery and Wearing Apparel, including Boots and Shoes	373	2	10*s.*	1*l.*	186 10 0	2 0 0	188 10 0
11. Ornamental Needlework on Muslin or other Textile Fabrics	9	—	10*s.*	—	4 10 0	—	4 10 0
12. Goods not included in other Classes	245	2	10*s.*	1*l*	122 10 0	2 0 0	124 10 0
13. Printed or Woven Designs on Textile Piece Goods	12,455	—	1*s.*	—	622 15 0	—	622 15 0
14. Printed or Woven Designs on Handkerchiefs and Shawls	394	—	1*s.*	—	19 14 0	—	19 14 0
	21,230	1,025					
Inspection Tickets	122		1*s.*		—	—	6 2 0
Searches under Section 53 and Rule 35	276		5*s.*		—	—	69 0 0
Clerical Errors amended	8		5*s*		—	—	2 0 0
Copies of Certificates of Registration	12		1*s.*		—	—	0 12 0
Legal Certificates	11		5*s.*		—	—	2 15 0
Requests for Subsequent Proprietorship	158 (64)		10*s.*		—	—	32 0 0
	158 (46)		2*s.*		—	—	4 12 0
	158 (48)		1*s.*		—	—	2 8 0
Office Copies	23		1*s.*		—	—	1 3 0
,, ,, Certified	2		2*s.*		—	—	0 4 0
					TOTAL		£4,104 10 0

APPENDIX L.

TRADE MARKS BRANCH.

The following TABLE shows the NUMBER of TRADE MARKS ADVERTISED and the number REGISTERED in the 50 different Classes in 1894 and in the two preceding years, and also the Total Number ADVERTISED and REGISTERED since the 1st January 1876.

Classes.	Classification of Goods.	1892.		1893.		1894.		Total from 1st January 1876.	
		Advertised.	Registered.	Advertised.	Registered.	Advertised.	Registered.	Advertised.	Registered.
		No.	No.	No.	No.	No.	No.	No.	No.
1	Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives.	71	75	95	82	80	82	1,692	1,558
2	Chemical substances used for agricultural, horticultural, veterinary, and sanitary purposes.	63	61	93	74	72	81	1,402	1,265
3	Chemical substances prepared for use in medicine and pharmacy.	165	184	222	195	179	180	4,161	3,730
4	Raw or partly prepared vegetable, animal, and mineral substances used in manufactures, not included in other classes.	74	47	56	76	47	43	1,048	957
5	Unwrought and partly wrought metals used in manufacture.	64	55	78	75	44	39	2,999	2,707
6	Machinery of all kinds, and parts of machinery, except agricultural and horticultural machines included in Class 7.	32	27	37	43	18	20	1,400	1,298
7	Agricultural and horticultural machinery, and parts of such machinery.	16	9	10	16	12	15	662	622
8	Philosophical instruments, scientific instruments, and apparatus for useful purposes. Instruments and apparatus for teaching.	17	17	28	24	27	22	510	459
9	Musical instruments	12	12	20	17	16	14	362	326
10	Horological instruments	18	12	8	12	12	9	377	340
11	Instruments, apparatus, and contrivances, not medicated, for surgical or curative purposes, or in relation to the health of men or animals.	24	16	21	27	21	19	484	445
12	Cutlery and edge tools	57	29	50	63	33	36	1,855	1,692
13	Metal goods not included in other classes	113	110	99	94	95	86	3,733	3,409
14	Goods of precious metals (including aluminium, nickel, Britannia metal, &c.) and jewellery, and imitations of such goods and jewellery.	35	28	29	32	28	26	985	907
15	Glass	18	14	19	17	17	17	408	379
16	Porcelain and earthenware	24	19	26	28	28	27	585	532
17	Manufactures from mineral and other substances for building or decoration.	17	17	14	10	4	9	374	336
18	Engineering, architectural, and building contrivances	28	31	22	15	32	23	806	714
19	Arms, ammunition, and stores, not included in Class 20	9	7	14	13	10	11	315	286
20	Explosive substances	13	16	8	5	11	11	273	252
21	Naval architectural contrivances and naval equipments, not included in Classes 19 and 20.	3	2	8	7	4	5	199	175
22	Carriages	42	45	37	36	35	30	525	466
23	Cotton yarn and sewing cotton	70	110	62	60	46	35	3,671	3,484
24	Cotton piece goods of all kinds	167	225	78	78	41	46	8,551	8,061
25	Cotton goods not included in Classes 23, 24, or 38	40	39	29	28	19	17	807	748
26	Linen and hemp yarn and thread	9	19	8	8	5	6	406	393
27	Linen and hemp piece goods	13	21	12	12	9	11	561	544
28	Linen and hemp goods not included in Classes 26, 27, and 50	10	19	12	10	8	9	317	309
29	Jute yarns and tissues, and other articles made of jute not included in Class 50.	8	15	9	10	3	4	160	157
30	Silk, spun, thrown, or sewing	9	15	14	12	11	12	462	438
31	Silk piece goods	20	24	27	25	23	24	554	528
32	Silk goods not included in Classes 30 and 31	19	23	19	13	12	19	409	396
33	Yarns of wool, worsted, or hair	36	44	24	23	17	15	697	664
34	Cloths and stuffs of wool, worsted, or hair	121	139	68	59	49	47	1,991	1,888
35	Woollen, worsted, and hair goods not included in Classes 33 and 34.	70	73	23	27	10	10	781	746
36	Carpets, floor-cloth, and oil-cloth	11	10	18	15	8	12	313	297
37	Leather, skins unwrought and wrought, and articles made of leather not included in other classes.	17	14	29	27	28	30	534	505
38	Articles of clothing	165	170	159	165	114	111	3,068	2,850
39	Paper (except paper-hangings), stationery, and book-binding.	86	89	117	107	110	102	2,655	2,310
40	Goods manufactured from india-rubber and gutta-percha not included in other classes.	23	20	29	29	27	26	388	360
41	Furniture and upholstery	22	18	25	26	12	15	379	345
42	Substances used as food, or as ingredients in food	517	461	507	495	453	450	7,365	7,120
43	Fermented liquors and spirits	303	320	315	302	204	210	6,491	5,882
44	Mineral and aërated waters, natural and artificial, including ginger-beer.	61	74	96	87	71	72	1,979	1,709
45	Tobacco, whether manufactured or unmanufactured	392	378	487	444	401	329	5,863	5,156
46	Seeds for agricultural and horticultural purposes	6	5	7	7	6	6	100	91
47	Candles, common soap, detergents; illuminating, heating, or lubricating oils; matches, and starch, blue, and other preparations for laundry purposes.	130	134	159	141	134	159	3,619	3,288
48	Perfumery (including toilet articles, preparations for the teeth and hair, and perfumed soap).	103	114	134	122	125	120	2,634	2,270
49	Games of all kinds and sporting articles not included in other classes.	31	33	30	27	23	23	580	510
50	Miscellaneous goods not included in other classes	207	210	231	202	176	180	3,565	3,148
	TOTAL	3,581	3,649	3,717	3,522	2,970	2,905	84,555	77,052

APPENDIX M.

TRADE MARKS BRANCH.

ACCOUNT of FEES RECEIVED from the 1st January to the 31st December 1894.

Description of Document, &c.	Number.	Fees.	Amount. £	s.	d.
Applications for Registration of Trade Marks: per Patent Office	7,870	5s.	1,967	10	0
" " " " : per Cutlers' Company	110	*5s.	13	15	0
Appeals to Board of Trade	42	1l.	42	0	0
Advertisements: for Additional Space	—	Various rates.	220	7	10
Oppositions: per Patent Office	114	1l.	114	0	0
" : per Cutlers' Company	1	*1l.	0	10	0
Registration of Trade Marks: per Patent Office	2,846	1l.	†2,849	8	0
" " " : per Cutlers' Company	§54	*1l.	27	0	0
Duplicates of Notifications of Registration	52	2s.	5	4	0
Certificates of preliminary Procedure	12	5s.	3	0	0
" to obtain Registration abroad	1,301	5s.	325	5	0
" for use in Legal Proceedings	56	1l.	56	0	0
" of Refusal	4	1l.	4	0	0
Corrections of Clerical Errors	270	5s.	67	10	0
Registration of subsequent Proprietors: per Patent Office	2,373	Various rates.	636	18	0
" " " " : per Cutlers' Company	113	*Various rates.	15	13	0
Rectifications of Register	8	10s.	4	0	0
Cancelling entries on Register	43	5s.	10	15	0
Altering Addresses on Register	152	5s.	38	0	0
Folios of Office Copies	234	4d.	3	18	0
Certifying Office Copies	34	1s.	1	14	0
Searches and Inspections: Head Office	2,708	1s.	135	8	0
" " : Manchester Branch	1,661	1s.	83	1	0
Applications for Hearings respecting Oppositions	113	1l.	113	0	0
Renewals of Registration of Trade Marks: per Patent Office	1,283	1l.	1,283	0	0
" " " " : per Cutlers' Company	35	*1l.	17	10	0
Additional Fees received with late Renewal Fees	50	10s.	25	0	0
Restoration Fees received with late Renewal Fees: per Patent Office	29	1l.	29	0	0
" " " " : per Cutlers' Company	1	*1l.	0	10	0
	TOTAL	-	£8,092	16	10

* Half of these fees is paid to the Cutlers' Company of Sheffield, consequently only half of the various amounts is returned as Patent Office receipts.

† Including fees for registration of "Series" of Trade Marks.

§ Exclusive of 33 Old Corporate Marks, for which no fee is charged for registration.

APPENDIX N.

Abridgment Classes and Appendices (1877-83) *issued* in 1894.

Illustrated Classes.

Bearings, &c.
Beverages.
Buildings, &c.
Cements, &c.
Cooking, &c.
Glass.
Grinding, crushing, &c.
Grinding or abrading.
Metals, Cutting, &c.
Velocipedes.

Unillustrated Classes.

Acids, &c., Divs. II. and III.
Electricity, &c., Divs. I.—VI.
Manufacture of iron, &c.
Metals and alloys.

Illustrated Appendices.

Bleaching, &c.
Preparing, &c., cork, &c.
Sewing, &c.

APPENDIX O.

Lists of Places Receiving Donations of Patent Office Works.

A.—*Places in the United Kingdom receiving a complete set of the publications of the Patent Office, including the Specifications, on condition that they shall be daily accessible to the public, for reference or for copying,* free of all charge.

Belfast (*Free Library*).
*Birmingham (*Central Library, Reference Department, Eden Place*).
Bolton-le-Moors (*Public Library, Exchange Buildings*).
Bradford, Yorkshire (*Free Library, Darley Street*).
Brighton (*Free Library*).
*Bristol (*Free Library, King Street*).
*Cardiff (*Free Library and Museum*) *from* 1871.
Carlisle (*Public Free Library, Tullie House*).
Derby (*Free Library and Museum*).
Dublin (*National Library of Ireland, Kildare Street*).
*Dundee (*Public Library, Albert Institute*).
*Glasgow (*Stirling's Library, Miller Street*).
Halifax (*Public Library, Akroyd Park*).
Horwich (*Mechanics' Institute*).
Huddersfield (*Corporation Offices*).
*Hull (*Mechanics' Institute, George Street*).
Ipswich (*Museum Library, Museum Street*).
Keighley (*Mechanics' Institute, North Street*).
Kidderminster (*Free Library*).
*Leeds (*Public Library*).
Leicester (*Free Library, Wellington Street*).
Liverpool (*Free Library, William Brown Street*).
London (*British Museum*).
(*Free Library, London Street, Bethnal Green*) *from* 1881.
*Manchester (*Free Library, King Street*).
Newcastle-upon-Tyne (*Public Library, New Bridge Street*).
Newport, Monmouth (*Free Library*).
Nottingham (*Free Public Libraries*).
Oldham (*Free Library, Union Street*).
Plymouth (*Free Library*).
Preston (*Dr. Shepherd's Library, Cross Street*).
Rochdale (*Free Library, Town Hall*).
Salford (*Free Library, Peel Park*).
*Sheffield (*Free Library, Surrey Street*).
Stockport (*Central Free Library*).
Swansea (*Free Library*).
Wolverhampton (*Free Library*).

B.—*Public Offices, &c., in the United Kingdom, and British Colonies and Foreign States receiving a complete set of the Publications of the Patent Office.*

Public Offices, &c.

Department of Science and Art, South Kensington.
*Museum of Science and Art, Edinburgh.
Public Record Office, Dublin.

British Colonies, &c.

Canada—Patent Office. Ottawa.
Council of Arts and Manufactures of Quebec, Montreal.
Public Library, Toronto.
India—Patent Office, Imperial Secretariat, Calcutta.
Patent Office, Secretariat, Bombay.
Patent Office, Secretariat, Madras.
New South Wales—Patent Office, Sydney.
New Zealand—Patent Office, Wellington.
Queensland—Patent Office, Brisbane.
South Australia—Colonial Institute, Adelaide.
Patent Office, Adelaide (*from* 1878).
Tasmania—General Register Office, Hobart.
Victoria—Patent Office, Melbourne.
Public Library, Melbourne.

Foreign States.

Austria—Polytechnic University, Vienna.
Belgium—Ministère de l'Industrie, Brussels.
Musée de l'Industrie, Palais du Midi. Brussels.
Denmark—Patent Office, Copenhagen (*from* 1893).
France—Bibliothèque Nationale, Paris.
Bureau de la Propriété Industrielle, Ministère du Commerce, Paris (*from* 1876).
France—Conservatoire des Arts et Métiers, Paris.
Germany—Kaiserliches Patentamt, Berlin.
Kaiserliches Statistische amt, Berlin.
Baden—Polytechnic School, Carlsruhe (*from* 1876).
Bavaria—Polytechische Verein, Munich.
Prussia—Königliche Bibliothek, Berlin.
Polytechnische Schule, Hanover.
Saxony—Polytechnische Schule, Dresden.
Mulhouse—Société Industrielle.
Italy—Ufficio delle Privative Industriali, Rome.
Royal Institution for the Encouragement of Science, Naples (*from* 1852).
Japan—Patent Office, Tokio (*from* 1884).
Norway—Patent Office, Christiania (*from* 1884).
Russia—Bibliothèque Impériale, St. Petersburg.
Polytechnic School, Riga.
Spain—Madrid.
Sweden—Patent Office, Stockholm.
United States—Patent Office, Washington, D.C.
Astor Library, New York, N.Y.
State Library, Albany, N.Y.
Franklin Institute, Philadelphia, Pa.
Free Public Library, Boston, Mass.
Public Library, Cincinnati, Ohio.
Free Public Library, Chicago, Ill.
Peabody Institute, Baltimore, Md.
Cornell University, Ithaca, N.Y.
Mercantile Library, St. Louis, Mo.
Mechanics' Institute, San Francisco, Cal.
Historical Society, Madison, Wis.

C.—*Places in the United Kingdom receiving the Abridgments of Specifications, and in some cases the Illustrated Official Journal of Patents.*

Aberdeen (*Public Library*).
Airdrie (*Free Public Library*).
Alloa (*Public Library*).
Alnwick (*Scientific and Mechanical Institution*).
Armagh (*Natural History and Philosophical Society*).
Ashton-under-Lyne (*Heginbottom Free Library*).
Aston, near Birmingham (*Aston Manor Public Library*).
Aylesbury (*Literary Institution, Temple Street*).
Ayr (*Carnegie Public Library*).
Bacup (*Mechanics' Institution*).
Banbury (*Mechanics' Institution*).
Barnsley (*Free Library*).
Barnstaple (*Literary and Scientific Institution*).
Barrow-in-Furness (*Free Public Library and Museum*).
Basingstoke (*Mechanics' Institute and Club*).
Berkhampstead, Great (*Mechanics' Institute*).
Birkenhead (*Free Public Library*).
Birmingham (*Central Library, Lending Department, Ratcliff Place*).
Blyth (*Mechanics' Institution*).
Bodmin (*Literary Institution*).
Bolton (*Technical School, Mawdley Street*).
Bootle (*Free Public Library*).
Bournemouth (*Library and Reading Room*).
Braintree (*Braintree and Bocking Literary and Mechanics' Institution*).
Brigg, Lincolnshire (*Reading Society*).
Burnley (*Mechanics' Institution*).
Burslem (*Wedgwood Institute*).
Bury (*Athenæum*).
Bury St. Edmund's (*Athenæum*).
Calne (*Literary Institution*).
Canterbury (*Museum and Library Committee*).
Cardiff (*South Wales Institution of Engineers, Park Place*).
Carmarthen (*Literary and Scientific Institution*).
Carnarvon (*Free Library*).
Cheltenham (*Permanent Library*).
Chester (*Free Library, St. John Street*).

* This Library has also received since 1893 a set of Specifications of United States Patents.

Colchester (*Young Men's Christian Association*).
Cork (*Free Library, Nelson's Place*).
Coventry (*Free Library*).
(*Technical Institute*).
Crewe (*Mechanics' Institution*).
Darwen (*Public Library*).
Devonport (*Free Public Library*).
Dewsbury (*Free Public Library*).
Doncaster (*Free Library*).
Dublin (*Trinity College*).
Dudley (*Institute*).
Dukinfield (*Library and Astley Institute*).
Dumbarton (*Free Public Library*).
Durham (*Mechanics' Institute*).
Ebbw Vale (*Literary and Scientific Institute*).
Edinburgh (*Royal Scottish Society of Arts*).
(*Heriot-Watt College*).
Exeter (*Albert Memorial Museum and Free Library*).
Farnham (*Institute*).
Faversham (*Institute*).
Frome (*Literary and Scientific Institution*).
(*Mechanics' Institution*).
Glasgow (*Athenæum*).
(*City Industrial Museum, Kelvingrove Park*).
(*Glasgow and West of Scotland Technical College*).
(*Institution of Engineers and Shipbuilders in Scotland*).
(*Philosophical Society*).
Gloucester (*Engineering Society, Bank Buildings*).
Guernsey (*Guille-Allés Library, Market Place*).
Halesworth (*Mechanics' Institute*).
Halifax (*Mechanics' Institute*).
Hanley (*Public Free Library*).
Hebden Bridge, near Todmorden (*Mechanics' Institution*).
Hereford (*Natural History, Philosophical, Antiquarian, and Literary Society*).
Heywood (*Public Free Library*).
Holbeck (*The Library*).
Huddersfield (*Technical School*).
Hull (*Literary, Scientific, and Mechanics' Institute*).
Inverness (*The Public Library*).
Jersey (*Greffe Office*).
Kendal (*Mechanics' Institute*).
Kettering (*Church Institute and Working Men's Club*).
Kilmarnock (*Public Library*).
Lancaster (*Mechanics' Institute and School of Science*).
Leamington Spa (*Free Library, Town Hall*).
Leeds (*Association of Engineers*).
(*Church Institute*).
(*Philosophical and Literary Society*).
(*Yorkshire College*).
(*Young Men's Christian Association*).
Leek, Staffordshire (*Literary and Mechanics' Institution*).
Leighton Buzzard (*Working Men's Mutual Improvement Society*).
Liverpool (*Polytechnic Society*).
Lockwood (*Mechanics' Institution*).
London (*Bow and Bromley Institute, Bow Road*).
(*Camberwell Central Library, Peckham Road, S.E.*).
(*Canning Town Free Public Library, Barking Road*).
(*Guildhall Library*).
(*Imperial Institute*).
(*Incorporated Law Society, Chancery Lane*).
(*Chartered Institute of Patent Agents, Southampton Buildings*).
(*Institution of Civil Engineers, 25, Gt. George Street*).
(*Institution of Mechanical Engineers, 19, Victoria Street, S.W.*).
(*Inner Temple*).
(*Iron and Steel Institute*).
(*Lincoln's Inn Library*).
(*London Institution, Finsbury Circus*).
London—(*London Library, St. James'*).
(*Parkes Museum of Hygiene, Margaret Street, W.*).
(*People's Palace, Mile End Road, E.*).
(*Society of Arts*).
(*Stratford Workmen's Hall, West Ham Lane, E.*).
(*War Office, Pall Mall*).
(*Westminster Free Public Library, Great Smith Street*).
(*Working Men's Club and Institute Union, Clerkenwell Road, E.C.*).
Loughborough (*Public Library*).
Lowestoft (*Library and Reading Room*).
Manchester (*Owen's College*).
Mansfield (*Free Public Library*).
Mere, near Bath (*Literary Association*).
Middlesbrough (*Mechanics' Institution*).
(*Free Library*).
Middleton (*Free Library*).
Newcastle-upon-Tyne (*North of England Institute of Mining and Mechanical Engineers*).
Newport, Isle of Wight (*Young Men's Society and Reading Room*).
North Shields (*Free Library*).
Northwich (*Brunner Free Public Library*).
Norwich (*Free Library*).
Nottingham (*Mechanics' Institution*).
Penzance (*Free Library*).
Perth (*Mechanics' Library, High Street*).
Pontypridd (*Free Library*).
Portsmouth (*Dockyard*).
(*Public Free Library*).
Reading (*Free Public Library and Museum*).
Redditch (*Literary and Scientific Institution*).
Redruth (*Redruth Institution*).
Richmond, Surrey (*Free Public Library*).
Rotherham (*Free Public Library*).
Ryde, Isle of Wight (*Young Men's Christian Association and Literary Institute*).
Saffron Walden (*Literary and Scientific Institution*).
St. Helen's (*Public Library*).
Scarborough (*Mechanics' and Literary Institute, Vernon Place*).
Shipley (*Salt Schools*).
Shrewsbury (*Free Public Library*).
Slough (*Leopold Institute*).
Southend (*Mechanics' Institute*).
South Shields (*Public Free Library*).
Spalding (*Christian Young Men's Association*).
Stafford (*Corporation Free Library*).
Stockton-on-Tees (*Free Library*).
Stowmarket (*Literary Institution*).
Sudbury, Suffolk (*Literary and Mechanics' Institute*).
Swansea (*Royal Institution of South Wales*).
Swindon, New (*G.W.R. Mechanics' Institution*).
Truro (*Institution*).
Tunbridge Wells (*Mechanics' Institution*).
Uttoxeter (*Reading Room and Library*).
Walsall (*Free Library*).
Wandsworth (*Public Library*).
Watford (*Public Library*).
Wednesbury (*Free Library*).
Wellingborough (*Working Men's Club*).
Wellington (*Young Men's Christian Association*).
West Bromwich (*Free Library*).
Weston-super-Mare (*Free Public Library*).
Whitby (*Museum*).
Whitehaven (*Free Public Library*).
Wimbledon (*Free Public Library*).
Winsford (*Free Public Library*).
Woolwich (*Ordnance Factories*).
Worcester (*Public Library and Hastings Museum*).
Workington (*Free Public Library and Reading Room*).

D.—*Places abroad receiving the Abridgments of Specifications, and in some cases the Illustrated Official Journal of Patents.*

Canada—Society of Civil Engineers, Montreal.
Cape of Good Hope.
Germany—Gotha—Ducal Friedenstein Collection.
Imperial and Provincial Library of the University, Strasburg.
Italy—Communal Library, Palermo.
Malta.
Mauritius.
Netherlands—Library of the Polytechnic School, Delft.
Switzerland—Bureau International pour la Protection de la Propriété Industrielle, Berne.
Federal Polytechnic School, Zurich.
United States—American Academy of Arts and Sciences, Boston.
American Society of Civil Engineers, New York.
City Library Association, Springfield, Massachusetts.
United States—University of Illinois, Urbana, Illinois.
Law Association, Philadelphia.
Mercantile Library Association, Pittsburgh, Pennsylvania.
Minnesota Historical Society, Saint Paul, Minnesota.
Odd Fellows' Library Association, San Francisco.
Patent Office Bar Association, Washington.
Public Library, Detroit, Michigan.
Rose Polytechnic Institute, Terre Haute, Indiana.
Wabash College, Crawfordsville, Indiana.
Young Men's Christian Association, Scranton, Pennsylvania.
Engineers' Club, 1122, Girard Street, Philadelphia.
Victoria—School of Mines, Ballarat.
Western Australia, Patent Office, Perth.

E.—*Places receiving some special portion of the publications of the Patent Office.*

Belfast (*The Linen Trade Board*).
Birmingham (*Mason College*).
Bradford (*Society of Dyers and Colourists*).
Coventry (*Watchmakers' Association*).
Dundee (*Association of Watchmakers and Jewellers*).
Guernsey (*Public Record Office*).
Kew (*Library of the Royal Gardens*).
Leek (*The Nicholson Institute*).
Liverpool (*Chemical Laboratory, University College*).
London (*Aeronautical Society*).
(*British Horological Institute*).
(*Institute of British Carriage Manufacturers*).
(*Institute of Electrical Engineers*).
(*Institution of Naval Architects*).
(*Metallurgical Department, King's College*).
(*Microscopical Society*).
(*Odontological Society*).
(*Royal Society*).
(*Surveyors' Institution*).
(*United Service Museum*).
Northwich (*Brunner Free Public Library*).
Stony Stratford (*Church Institute*).
Woolwich (*Ordnance Committee*).

F.—*Places in the United Kingdom receiving the Illustrated Official Journal of Patents.*

Belfast (*Queen's College*).
Blackburn (*Free Library and Museum*).
Blackpool (*Free Library*).
Bristol (*School of Science, Merchants' Hall*).
Burnley (*Corporation Free Library*).
Cambridge (*Free Library*).
Chatham (*Dockyard*).
Croydon (*Central Free Public Library*).
Dublin (*King's Inn Library*).
(*Law Library, Four Courts*).
Dudley (*Free Library*).
Dundalk (*Free Library*).
Edinburgh (*Advocates' Library*).
Edmonton (*Public Library*).
Elgin (*Library*).
Enfield (*Small Arms Factory*).
Galashiels (*Public Library*).
Gravesend (*Public Library*).
Harlesden (*Public Library*).
Llanelly (*Mechanics' Institution*).
London (*Admiralty*).
(*Austrian Embassy*).
(*Bar Library, Royal Courts of Justice*).
(*Battersea Public Library, Lavender Hill*).
(*Board of Trade*).
(*Borough Road Polytechnic Institution*).
(*Buckingham Palace Library*).
(*Clerkenwell Public Library*).
(*Ealing Free Public Library*).
(*Electrician, The*).
(*Fulham Free Public Library*).
(*German Embassy*).
(*Hammersmith Free Public Library*).
(*Historical Society, Royal*).
(*Home Office*).
(*India Office*).
(*Inland Revenue Department*).
(*Kensington Free Public Library, Notting Hill*).
(*Kilburn Public Library*).
London—(*Lewisham Public Libraries*).
(*London Chamber of Commerce*).
(*Old Brompton Road Free Public Library*).
(*Pharmaceutical Society of Great Britain*).
(*Polytechnic, Regent Street*).
(*Postal Stores, Mount Pleasant, Clerkenwell*).
(*Privy Council*).
(*Probate Library, Royal Courts of Justice*).
(*Rotherhithe Public Library*).
(*Royal Institution*).
(*Stoke Newington Public Library*).
(*Stratford, West Ham Public Libraries*).
(*Toynbee Hall*).
(*Treasury*).
(*Whitechapel Free Public Library*).
(*Willesden Green Public Library*).
Ludlow (*Young Men's Christian Association*).
Macclesfield (*Free Library, Town Hall*).
Manchester (*Association of Engineers*).
Newcastle-on-Tyne (*Institution of Engineers and Ship Builders*).
Newport, Mon. (*Chamber of Commerce*).
Oldbury (*Public Library*).
Oxford (*Bodleian Library*).
Pembroke (*Dockyard*).
Sheerness (*Dockyard*).
Southport (*Atkinson Free Library*).
Sunderland (*Public Free Library*).
Thornaby-on-Tees (*Public Library*).
Walthamstow (*Free Public Library*).
Wigan (*Corporation Library*).
Wolverton (*London and North Western Railway Library*).
Woolwich (*Royal Artillery Institution*).
(*Royal Gun Factory*).
York (*Guildhall*).
(*Institute of Art, Literature, and Science*).
(*Free Library*).

G.—*Places abroad receiving the Illustrated Official Journal of Patents.*

(*a.*) *British Colonies, &c.*

British Guiana—Georgetown, Demerara—Government Secretary's Office.
Canada—Toronto—Bureau of Agriculture.
Canadian Institute.
Winnipeg—Library of Parliament.
Ceylon—Government.
India—Ishapore, Bengal—Gunpowder Factory.
New South Wales—Sydney—Australian Institute of Patent Agents.
Trinidad—Government.
Victoria—Melbourne—Department of Mines.

(*b.*) *Foreign States.*

Austria—Prague—Polytechnic University.
Austria—Vienna—Austrian Trade Journal.
Austro-Hungarian Millers' Journal.
Austro-Hungarian Mining and Metal Industry Journal.
Belgium—Brussels—Society of Electricians.
France—Marseilles—Société Scientifique Industrielle.
Paris—L'Electricien.
Société Nationale d'Agriculture.
Germany—Aix-la-Chapelle—König. Technische Hochschule.
Stuttgart—Bibliothek der Musterlagers.
Switzerland—Berne—Bureau de la Propriété Intellectuelle.
United States—Allegheny—Engineers' Society of Western Pennsylvania.
Harrisburg—State Library of Pennsylvania.
Washington—Smithsonian Institution.

H.—*Places receiving the Trade Marks Journal only.*

Edinburgh (*Fishery Board for Scotland*).
Jamaica—Spanish Town (*Registrar General*).
London (*Board of Agriculture*).
Netherlands—The Hague (*Office de la Propriété Industrielle*).

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE.
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1895.

REPORT by the Board of Trade on their Proceedings and Business under the Weights and Measures Acts, 1878 and 1889 (41 & 42 Vict. c. 49, and 52 & 53 Vict. c. 21).

In pursuance of Section 33 of the Weights and Measures Act, 1878, 41 & 42 Vict. c. 49, the Board of Trade make the following Report to Parliament :—

Verification of Standards.

Since the issue by the Board of Trade of their last Report (2nd August 1894), the several standards and instruments mentioned in Appendix No. 1 of the present Report have been verified at the Standards Department for official use, or for the use of Governments and authorities abroad.

Appendix 1.

Verification of Standards in Ireland.

Copies of the following Board of Trade standards of length, weight, and capacity, deposited at the Royal Irish Constabulary Depôt, Phœnix Park, Dublin, have been duly re-verified this year by comparison with the Imperial standards. These copies are used annually in the verification of the standards provided by the Local Authorities in Ireland :—

Avoirdupois Standards, from 56 lb. to ½ dram.
Grain Weights, from 4,000 grains to 0·01 grain.
Measures of Capacity, from a bushel to a quarter gill.
A yard measure subdivided into feet and inches, the inch being divided into decimal, duodecimal, and binary equal parts.

At the annual verification in September last the local standards of Belfast, Cork (West Riding), Drogheda, Galway (County of the Town), Leitrim County, Louth (District of Dundalk), Mayo County, Roscommon County, and Westmeath, were duly re-verified at the Depôt by the Standards Department.

Local Standards.

Appendix 2.

Appendix No. 2 contains a list of districts of Local Authorities, for which Local Standards have been verified or re-verified by the Board of Trade, since 2nd August 1894, in accordance with the provisions of Sections 37, 40, and 41 of the Act of 1878.

General Regulations for the guidance of local Inspectors.

General Regulations have, under Section 9 of the Act of 1889, with the approval of the Board of Trade, been made by the Local Authorities of the following districts for the guidance of their Inspectors of Weights and Measures in the performance of their duties :—

Halifax (County Borough).
Lossiemouth and Branderburgh (Burgh).
Ossett (Borough).

Additional or amended General Regulations have also been made by the Local Authorities of the following districts :—

Ashton-under Lyne (Borough).
Clitheroe (Borough).
Glasgow (Burgh).
Newcastle-on-Tyne (County Borough).
Scarborough (Borough).
Sheffield (County Borough).
Yorks, West Riding (County).

Bye-laws as to the sale of coal.

The Local Authorities of the following districts have, under Section 28 of the Act of 1889, made bye-laws as to the sale of coal :—

Dudley (County Borough).
Newcastle-on-Tyne (County Borough).
Pembroke (Ireland) (Township).
Rathmines and Rathgar (Ireland) (Township).

Additional or amended bye-laws have also been made by the Local Authorities of the following districts:—

Bootle (County Borough).
Folkestone (Borough).
Scarborough (Borough).
Sussex, East (County).
Yorks, West Riding (County).

Appendix 3. Examples of bye-laws which have been approved by the Board of Trade, in substitution for others revoked, are given in Appendix No. 3.

Reports of local Inspectors of Weights and Measures.

Appendix 4. The Local Authorities of the districts named in Appendix No. 4 have, since 2nd August 1894, forwarded copies of their Inspectors' Annual Reports to the Board of Trade.

A Model Regulation (No. 12), which was proposed by the Board of Trade on 1st January 1890 as one of other Model Regulations for the use of Local Authorities in giving effect to the requirements of Section 9 of the Act of 1889, states that the local Inspector should once in every year make a Report to his Local Authority, and that a copy of such Report should be sent annually to the Board of Trade. Under the Model Regulations the Report should state the number of shops and places visited by each Inspector during the year; the number of cases where weights, &c., were found in use contrary to the Acts; the number of weights seized during the year; and the number of convictions; and the Report should also include a statement as to the number of each denomination of weight, &c., stamped in the Inspector's district, and the amount of stamping fees and adjusting charges. The Report should also include a statement of the income and expenditure of the Inspector's office during the year.

Examination of Inspectors of Weights and Measures.

Appendix 5. Since the date of the last Report, the Board of Trade have, under Section 11 of the Act of 1889, examined 152 candidates for Inspectorships of Weights and Measures. Of these candidates 83 passed and obtained certificates of qualification. The examinations were conducted at London, Edinburgh, Dublin, and Bristol (Appendix No. 5).

Adjustment of Weights, &c.

When weights used in trade are found by an Inspector to be incorrect as compared with his standards, such weights are then either required to be re-adjusted, or new correct weights have to be substituted for them. The re-adjustment is either done by the Inspector himself, according to fixed charges approved by the Board of Trade (which charges are paid over to the Local Authorities by their Inspectors), or else the re-adjustment is done by a scale-maker or ironmonger without reference to the Inspector. The practice of the Local Authorities varies in this respect, but in any district where the Local Authority have desired their Inspector himself to re-adjust any weights that he finds incorrect when sent to his office for examination, then such Inspector is required by Section 12 of the Act of 1889, to be authorised by the Board of Trade to adjust. In pursuance of

Appendix 6. that Section, the Board of Trade have, during the past year, authorised the 43 Inspectors named in Appendix No. 6 to this Report to adjust weights and measures in the several districts therein stated.

The attention of Local Authorities, whose Inspectors are authorised to adjust, has been invited to the expediency of adopting uniform sizes of

Appendix 7. adjusting holes for brass weights (Appendix No. 7).

Inspectors' instrumental equipment.

The instrumental equipment provided by Local Authorities for the use of their Inspectors, in pursuance of Section 40 of the Act of 1878 and Section 7 of the Act of 1889, necessarily includes scale-beams, by which traders' weights may be accurately tested, and in their last Annual Report the Board observed that Local Authorities appear generally to desire to place in the Inspectors' hands weighing instruments of modern form. Since the date of that Report a large number of Inspectors' scale-beams have been submitted to the Standards Department for examination (Appendix

Appendix 8. No. 8).

The

The Local Authorities of the following districts, namely

Bournemouth (Borough),
Coventry (County Borough),
Derby (County),
Gloucester (County),
London (County),
Oxford (County),
Preston (County Borough),
Yorks, West Riding (County),

have provided their Inspectors with new beams of the approved form shown in Appendix No. 9. Appendix 9.

In December last the Board of Trade received from the International Committee of Weights and Measures, at Paris, a Standard of the metre, in the form of a bar one metre in length (mètre-â-bouts), made of iridio-platinum metal. This completes the three primary Metric Standards required to be delivered to this country by the Committee, as is pointed out in a Memorandum appended to the present Report (Appendix No. 10). The President and Council of the Royal Society visited the Standards Office on 21st February last, and inspected the new Metric Standards. Metric Standards. Appendix 10.

In December last, the Board of Trade, at the request of the International Committee of Weights and Measures, also forwarded to the Committee, in charge of an officer of the Board of Trade, a representative copy (P.C. VI.), of the Imperial Standard Yard, so that a new inter-comparison of the length of the yard with that of the metre might be made at Paris. Before the removal of the Standard P.C. VI. it was carefully compared with the primary Imperial Standard, and the results of such comparison are stated in the attached Report of the Superintendent of Weights and Measures (Appendix No. 11). Appendix 11.

It is provided by the Coinage Act, 1870 (Section 17) that the standard weights for weighing and testing the coin of the realm shall be placed in the custody of the Board of Trade, and that they shall, from time to time, cause weights of each coin of the realm, for the time being, and of multiples of such of those weights as may be required, to be made and duly verified. It is also provided by the Act that the Master of the Mint shall, from time to time, cause copies to be made of such standard weights, and that once at least in every year the Board of Trade and the Master of the Mint shall cause such copies to be compared and duly verified with the standard weights in the custody of the Board of Trade. In accordance with these requirements the coin weights of the Royal Mint, as well as the decimal series of reference bullion standard weights from 500 ounces to 0·001 ounce troy, have, during the past year, been re-verified at the Standards Department. Coinage Act, 1870. 33 & 34 Vict. c. 10.

By the same Act it is also provided that the standard trial plates of gold and silver used for determining the justness of the gold and silver coins of the realm shall be in the custody of the Board of Trade, and that the performance of all duties in relation to such trial plates shall be part of the business of the Standards Department. The Act also provides that the Board of Trade shall, when necessary, cause new standard trial plates to be made and duly verified, of such standard fineness as may be in conformity with the provisions of the Act (gold, millesimal fineness equals 916·66; silver, millesimal fineness 925; and bronze coins of mixed metal, copper, tin, and zinc). In 1873 new trial plates of pure gold and pure silver (millesimal fineness equals 1000) and of standard gold and standard silver (916·66 and 925) were made, and copies of such plates were then issued to the Royal Mint, and also to the Indian and Australian Mints, as well as to the Assay Offices at Birmingham, Sheffield, Edinburgh, Dublin, Exeter, Newcastle, Chester, and Glasgow.

It is further provided by the Coinage Act, 1870, that for the purpose of ascertaining that coins issued from the Mint have been coined in accordance with the Act, a trial of the pyx shall be held at least once in every year, and that it shall be lawful for Her Majesty, by Order in Council, to make

regulations respecting the trial of the pyx, and, in particular, as to the summoning of a jury of not less than six out of competent freemen of the mystery of Goldsmiths of the City of London, or other competent persons, and the production by the Board of Trade, at the trial of the jury so summoned, of the standard trial plates and standard weights. In accordance with this provision of the Coinage Act, 1870, and regulations with reference to the trial of the pyx made by an Order in Council dated 29th June 1871, the standard trial plates and weights were therefore produced in the usual course by the officers of the Board of Trade at the annual trial of the pyx held at Goldsmiths' Hall, London, on the 3rd July 1895.

Sale of Gas Act, 1859. 22 & 23 Vict. c. 66.

The copies of the Board of Trade Model Gasholders representing Standards of the cubic foot, deposited under the Sale of Gas Act, 1859, with the Magistrates of the City of London, have been removed into new offices provided by the Magistrates for the use of their Inspector of Gas Meters at Lower Whitecross-street, E.C., and these copies have been re-adjusted.

Similar copies of the Models deposited with the Corporation of Dublin are also now being re-adjusted under the directions of the Standards Department; and the re-verification of other copies of such Models deposited at Edinburgh will be proceeded with next spring.

During the past year Standard Gas-measuring Instruments have been verified or re-verified for the use of the Local Authorities and Companies named in Appendix No. 1 (3).

Appendix 1.

Apparatus for testing Petroleum.

The Petroleum Act, 1879, provides that a Model of the Apparatus as described in Schedule 1 to that Act shall be deposited with the Board of Trade, and that the Board of Trade shall cause to be compared with such Model, and verified, every Apparatus constructed in accordance with the Act which is submitted to them for the purpose. Since the date of the last Annual Report (2nd August 1894) 41 Petroleum-testing Apparatus have been verified at the Standards Department where the Model is deposited. The Petroleum Acts, 1871 and 1879, 34 & 35 Vict. c. 105, 42 & 43 Vict. c. 47, also provide that any officer authorised by the Local Authority may purchase any petroleum from any dealer in it with the view of ascertaining that such petroleum does not give off an inflammable vapour at a temperature of less than 73 degrees of Fahrenheit's thermometer. In many districts the Inspector of Weights and Measures acts also as Inspector of Petroleum under these Acts.

Capacity of the "Tun" measure.

A question recently arose between two official authorities as to the true capacity of the weight of a tun of water on the 3rd June 1824, before the passing of the Weights and Measures Act, 1824. The two authorities agreed to abide by the decision of the Standards Department as to what was the capacity of the old tun measure; and a copy of a Memorandum on the capacity of a tun of water is attached to this Report (Appendix No. 12).

Appendix 12.

Board of Trade (Standards Department),
14 August 1895.

Courtenay Boyle.

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Appendix, No. 1.

LIST of Primary and other Standards and Instruments verified since 2nd August 1894, for official use, or for Governments and Authorities abroad.

1. The following Primary Standards have been verified by the Department for its own use :—

Avoirdupois weight of a Cental.
Bullion weights, 500 oz. to 0·001 oz. (Series S).
Measures of capacity, bushel to ¼ gill.
Measures of length, 10 feet and 10 links (pine rods).
Cubic foot bottle (G. O. T.).
Glass flasks, 2,000 grains, 4 fluid oz., and gill.

Standards at Royal Irish Constabulary Depôt, Dublin :

56 lb. to ½ dr.
Bushel to ¼ gill.
Yard.
&c.

2. The following Standards have been verified for official use in the United Kingdom or abroad :—

Admiralty (Her Majesty's Dockyard, Portsmouth) :

Three pairs of 7½-inch Callipers.

Calcutta :

A standard measuring tape of 100 feet, and one of 66 feet.

Durban Corporation (Natal) :

Standard Weights, 56 lb. to ½ dram, and measure of length of a yard.

Manchester Ship Canal Company :

Standard Weights of—

56 lb. to ½ dr.
1,000 grains to 0·01 grain.

National Bank of the South African Republic :

Decimal Troy Bullion weights, 500 to 0·001 oz.

Perth City, Western Australia :

Standard Weights of—

56 lb. to 1 oz.
50 oz. to 0·001 oz.

Royal Mint :

Decimal Troy Bullion Weights, 500 to 0·001 oz., and standard coin weights.

Sydney Branch of the Royal Mint :

Decimal Troy Bullion Weights, 300 to 0·001 oz.

Russian Imperial Department of Commerce and Manufactures, St. Petersburgh :

Ten measuring tapes of 100 feet, and ten of 60 feet.

War Department :

Eight sets of Standard measures of capacity, from peck to ½ gill.

3. Gas-measuring

3. Gas-measuring Instruments have been verified since 2nd August 1894 for the undermentioned Authorities and Companies :—

Belfast Corporation.
Bridgnorth Corporation.
Bristol Corporation.
Cheltenham Corporation.
Chertsey Gas Consumers' Company.
Dublin Corporation.
Earl of Durham's Collieries.
Gas Light and Coke Company.
Horsham Gas Company.
Keighley Corporation.
Kendal Corporation.
Leeds Corporation.
Liverpool Corporation,
London Corporation.
London County Council.
Middlesbrough Corporation.
Paignton Gas Company.
Pontefract Gas Company.
Reading Corporation.
Rochester, Chatham, and Strood Gas Light Company.
Salford Corporation.
Scarborough Corporation.
Shanghai Municipality, China.
Sheffield Corporation.
Torquay Gas Company.
Uttoxeter Gas Works.

APPENDIX, No. 2.

LIST of DISTRICTS of LOCAL AUTHORITIES for whom LOCAL STANDARDS have been verified or re-verified by the BOARD OF TRADE, or locally compared, since 2nd August 1894.

(*a*) Verified or re-verified by the BOARD OF TRADE.

COUNTIES.

ENGLAND:

- Berks.
- Bucks.
- Chester.
- Derby.
- Devon.
- Dorset.
- Essex.
- Hants.
- Kent.
- Leicester.
- Lincoln: Lindsey Division.
- London.
- Middlesex.
- Northumberland.
- Oxford.
- Rutland.
- Salop.
- Somerset.
- Suffolk, West.
- Surrey.
- Sussex, East.
- Sussex, West.
- Wilts.
- Yorks, East Riding.

ENGLAND—*continued.*

- Yorks, North Riding.
- Yorks, West Riding.

WALES:

- Carnarvon.
- Denbigh.
- Flint.

SCOTLAND:

- Dumfries.
- Edinburgh.
- Wigtown.

IRELAND:

- Cork, East Riding.
- Cork, West Riding.
- Leitrim.
- Louth (District of Dundalk).
- Mayo.
- Queen's County.
- Roscommon.
- Westmeath.

LIST of Districts of Local Authorities for whom Local Standards have been Verified, &c.—*continued.*

BOROUGHS AND BURGHS.

ENGLAND:

- Banbury.
- Barrow-in Furness.
- Berwick-on-Tweed.
- Beverley.
- Birkenhead (Mersey Docks and Harbour Board District).
- Bootle.
- Bournemouth.
- Brighton.
- Bristol.
- Carlisle.
- Chesterfield.
- Clitheroe.
- Coventry.
- Doncaster.
- Dudley.
- Durham.
- Hanley.
- Hull.
- Leeds.
- Liverpool.
- London.
- Newark.
- Newcastle-on-Tyne.
- Newcastle-under-Lyme.
- Newport (Monmouthshire).
- Nottingham.
- Oldham.
- Ossett.
- Peterborough.
- Rotherham.
- St. Albans.
- Scarborough.

ENGLAND—*continued.*

- Sheffield.
- Southport.
- South Shields.
- Truro.
- Warrington.
- West Bromwich.
- Wolverhampton.
- Worcester.

WALES:

- Carmarthen.
- Swansea.

SCOTLAND:

- Aberdeen.
- Dunbar.
- Dundee
- Dunfermline.
- Falkirk.
- Forfar.
- Govan.
- Greenock.
- Oban.
- Stirling.
- Wigtown.

IRELAND:

- Belfast.
- Drogheda.
- Galway.

(*b*) Locally compared by Local Authorities and comparison approved by the BOARD OF TRADE.

COUNTIES.

ENGLAND:

- Berks.
- Dorset.
- Essex.
- Suffolk, West.

APPENDIX, No. 3.

EXAMPLES of Bye-laws relating to the Sale of Coal, which have been approved by the Board of Trade, in substitution for others repealed.

WEIGHTS AND MEASURES ACT, 1889.

BYE-LAWS relating to the Sale of Coal, made by the County Council of the Administrative County of East Sussex (being the Local Authority within the meaning of the Weights and Measures Act, 1889), pursuant to the provisions of Section 28 of that Act.

In these bye-laws the term "vehicle" means any carriage, cart, waggon, truck, barrow, or other means of carrying coal by land, in whatever manner the same may be drawn or propelled, but does not include a railway truck or waggon.

1. Every person who shall carry for sale or delivery, or shall offer for sale from any vehicle coal in quantities not exceeding 2 cwt., shall carry such coal in sacks, bags, or other receptacles, containing either 2 cwt., 1¼ cwt., 1 cwt., ½ cwt., ¼ cwt., or 14 lbs., and shall mark and keep marked in printed capital letters not less than two inches in length on every such sack, bag, or receptacle the correct weight of coal therein, or shall affix or cause to be affixed to the top of every such sack, bag, or other receptacle a metal label indicating the correct weight of coal therein. No person shall sell or offer for sale in sacks, bags, or other receptacles coal in quantities not exceeding 2 cwt., which is of less weight than that specified on such sacks, bags, or other receptacles.

2. The person in charge of every vehicle carrying coal for sale or delivery to a purchaser shall carry therewith a correct weighing instrument of a form approved by the Local Authority, together with correct and appropriate weights for such instrument; and such person shall re-weigh the coal upon being requested to do so by the purchaser, or by anyone on his behalf, or by an Inspector of Weights and Measures.

3. Every person who shall sell, deliver, or offer for sale from any vehicle coal in quantities not exceeding 2 cwt., shall have clearly and legibly painted upon some conspicuous part of the vehicle in letters not less than one inch in height, and of a proportionate breadth, the name and place of business of the person selling such coal, and shall keep the same legible and undefaced.

4. Every person who shall sell, or offer for sale, at any wharf, yard, or other place, coal in any quantity not exceeding 2 cwt., and not contained in sacks, bags, or other receptacles, marked as required in Bye-law No. 1, shall sell such coal in quantities of either 2 cwt., 1¼ cwt., 1 cwt., ½ cwt., ¼ cwt., or 14 lbs., and shall weigh such coal by means of a weighing instrument duly verified and stamped by an Inspector of Weights and Measures, before the sale or delivery thereof; and if required shall re-weigh the same in the presence of the purchaser, or of anyone on his behalf, or of an Inspector of Weights and Measures.

5. Every person in charge of a vehicle in which coal is carried in bulk shall, if so required by or on behalf of a purchaser, or by an Inspector of Weights and Measures, carry such coal to any public weighing machine for the purpose of having the same weighed or re-weighed, provided that no person shall be required to carry such coal for the purpose aforesaid for a greater distance than half-a-mile from the place where such requisition is made; and that such person may weigh or re-weigh the coal at the nearest stamped weighing machine which may be available for such purpose within the prescribed distance of half-a-mile. Where any such coal or vehicle has, at the instance of the purchaser, been weighed or re-weighed in pursuance of this bye-law, and found to be of the weight stated in that behalf by the seller of the coal or the person in charge of the vehicle, the purchaser shall be liable to the payment of all reasonable costs actually incurred of and incidental to the weighing or re-weighing.

6. Every

6. Every person who shall offend against any of the foregoing bye-laws shall be liable for every such offence to a penalty of 5*l*. Provided nevertheless that the Justices or Court before whom any complaint may be made or any proceedings may be taken in respect of any such offence may, if they think fit, adjudge the payment as a penalty of any sum less than the full amount of the penalty imposed by this bye-law.

7. The bye-laws made by the County Council on the 7th day of October 1890, are hereby repealed as from the date when these bye-laws are approved by the Board of Trade. Provided that such repeal shall not affect any proceedings which may at the date of such confirmation have been commenced against any person or persons for any breach of the original bye-laws.

The foregoing bye-laws were made and adopted by the East Sussex County Council at a meeting of the said Council held on the 2nd day of October 1894, and the Common Seal was directed to be affixed thereto.

The Common Seal was affixed hereto by order of the said County Council of East Sussex, in the presence of

W. V. K. Stenning,
Vice-Chairman of the said County Council, and of

F. Merrifield,
Clerk of the said County Council.

Seal of the County Council of East Sussex.

Approved by the Board of Trade this 11th day of October 1894.

Cosmo Monkhouse,
Assistant Secretary.

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE.

WEIGHTS AND MEASURES ACT, 1889.—PART II.—SALE OF COAL.

BYE-LAWS.

WE, the County Council for the West Riding of Yorkshire, being the Local Authority of the said Riding under and by virtue of Section 28 of the Weights and Measures Act, 1889, at a meeting held at the Town Hall, Wakefield, in the said Riding, on Wednesday, the 10th of October 1894, do hereby (subject to the approval of the Board of Trade) make the following bye-laws, namely:—

1. Every person hawking, selling, or exposing for sale coal in quantities not exceeding two hundredweight, shall cause his name and place of business and residence to be registered in the books to be provided for the purpose, at the office of the Inspector of Weights and Measures in whose district he resides or carries on business, and on each and every occasion on which he shall change his registered place of business or residence, he shall within seven days thereafter, cause to be registered, as aforesaid, particulars of such change.

2. Every person who shall sell or offer for sale or delivery at any wharf, yard, or from any vehicle, or other place, coal in any quantity not exceeding two hundred-weight, and not being less than fourteen pounds (whether contained in sacks, bags, or other receptacles or not), shall sell such coal in quantities of either two hundredweight, one hundredweight, half-a-hundredweight, quarter-of-a-hundredweight, or fourteen pounds, and if such coal is contained in sacks, bags, or other receptacles, shall securely affix, or cause to be securely affixed, to the top or side of every such sack, bag, or other receptacle, a metal label indicating the correct weight of the coal therein, and every person so selling, or offering for sale, coal, as aforesaid, shall weigh such coal by means of a weighing instrument, duly verified and stamped by an Inspector of Weights and Measures, before the sale or delivery thereof, and if required shall re-weigh the same in the presence of the purchaser, or anyone on his behalf, or of an Inspector of Weights and Measures, or other person appointed for the purpose by the Local Authority.

3. Every seller of coal shall provide, and every person employed by him who shall convey or carry out coal in any vehicle, or on any horse, or other beast of burden, for sale or delivery in quantities not exceeding two hundredweight, shall carry therewith a correct weighing instrument of a form approved by the Local Authority, together with correct weights, and such person shall re-weigh the coal upon being requested to do so by the purchaser, or by anyone on behalf of the purchaser, or by an Inspector of Weights and Measures, or other person appointed for the purpose by the Local Authority.

4. Every person who shall sell, or offer for sale, from any vehicle coal in quantities not exceeding two hundredweight, shall have clearly and legibly painted upon some conspicuous part of the right-hand side or end board of such vehicle, in letters not less than one inch in height and of proportionate breadth, the name and the street or road and place of abode of the person selling such coal, and shall keep the same legible and undefaced.

5. Every person in charge of a vehicle in which coal is carried in bulk shall, if required by any person purchasing any coal from him, or by an Inspector of Weights and Measures, or other person appointed for the purpose by the Local Authority, carry such coal to any weighing machine stamped by an Inspector of Weights and Measures, for the purpose of having the same weighed or re-weighed, in the presence of the purchaser or Inspector of Weights and Measures, or person appointed as aforesaid, provided that no person shall be required to carry such coal for the purpose aforesaid for a greater distance than half-a-mile, and such person may weigh or re-weigh the coal at the nearest stamped weighing machine which may be available for such purpose within the prescribed distance of half-a-mile.

6. Every weighing instrument required by these bye-laws to be carried by a seller of coal, or a person in charge of a vehicle in which coal is carried for sale by retail, shall be in a form approved by and in conformity with the regulations of the Local Authority for the time being in force, and, if a counterpoise machine, shall have the counterpoises denominated or marked in such a manner as to correspond with the number or mark on the machine to which such counterpoises belong.

7. Any person offending against, or breaking any one of the foregoing bye-laws shall, on conviction, be liable to a penalty not exceeding 5*l*.

8. The bye-laws made by the County Council on the 13th day of May 1891, are hereby repealed as from the date when these bye-laws are approved by the Board of Trade. Provided that such repeal shall not affect any proceedings which may at the date of such confirmation have been commenced against any person or persons for any breach of the original bye-laws.

Given under the Common Seal of the County Council of the West Riding of Yorkshire, pursuant to an Order of the said Council, made the tenth day of October, in the Year One thousand eight hundred and ninety-four.

Sealed with the Common Seal of the County Council of the West Riding of Yorkshire, in the presence of

W. J. R. Fox,
The Member of the said County Council having the custody of the Key of the said Seal.

W. Vibart Dixon,
Deputy Clerk of the said County Council.

The above bye-laws, numbered 1 to 8, were approved by the Board of Trade, this Twelfth day of December, One thousand eight hundred and ninety-four.

C. Cecil Trevor,
Assistant Secretary.

APPENDIX, No. 4.

LIST of DISTRICTS of LOCAL AUTHORITIES from whom INSPECTORS' ANNUAL REPORTS have been received since 2nd August 1894.

Aberdeen, Borough.
Aberdeen, County.
Accrington.
Airdrie.
Arbroath.
Argyll.
Ashton-under-Lyne.
Ayr, County.
Bacup.
Banbury.
Banff, County.
Barnstaple.
Barrow-in-Furness.
Bath.
Batley.
Bedford, Borough.
Bedford, County.
Berwick, County.
Berwick-on-Tweed.
Beverley.
Birkenhead.
Birmingham.
Blackburn.
Blackpool.
Bolton.
Bootle.
Boston.
Bournemouth.
Bradford.
Brecon, County.
Bridgwater.
Brighton.
Bristol.
Bucks.
Bury (Lancs.)
Bute, County.
Caithness, County.
Cambridge, Borough.
Cambridge, County.
Campbeltown.
Canterbury.
Cardiff.
Cardigan, County.
Carlisle.
Carmarthen, Borough.
Carmarthen, County.
Carnarvon, County.
Chepping Wycombe.
Cheshire.
Chester.
Chesterfield.
Clackmannan, County.
Clitheroe.
Coatbridge.
Colchester.
Congleton.
Cornwall.
Coventry.
Croydon.
Cumberland.
Dalkey, Township.
Darlington.
Denbigh, County.
Derby, County.
Derby, County Borough.
Devonport.
Devonshire.
Dewsbury.
Doncaster.
Dorset.
Dover.
Dublin, City.
Dumbarton, Burgh.
Dumbarton, County.
Dumfries, County and Burghs.
Dundee.
Dunfermline.
Durham, Borough.
Durham, County.
Edinburgh, Burgh.
Edinburgh, County.
Elgin, Burgh.
Elgin, County.
Ely, Isle of.
Essex.
Fife, County.

List of Districts of Local Authorities from whom Inspectors' Annual Reports have been received since 2nd August 1894—*continued.*

Flint, County.
Forfar, Burgh.
Forfar, County.
Forres.
Fraserburgh.
Galashiels.
Gateshead.
Glasgow.
Gloucester, County.
Gloucester, County Borough.
Govan.
Grantham.
Gravesend.
Great Grimsby.
Guildford.
Halifax.
Hamilton.
Hanley.
Hants.
Hartlepool.
Hastings.
Hawick.
Hereford, Borough.
Hereford, County.
Hertford, County.
Huddersfield.
Huntingdon, County.
Hull.
Inverkeithing.
Inverness, Burgh.
Inverness, County.
Ipswich.
Ireland (ex-officio Inspectors).
Irvine, Burgh.
Kendal.
Kent.
Kidderminster.
Kincardine, County.
King's Lynn.
Kirkcudbright, County.
Lanark, County.
Lancaster, Borough.
Lancaster, County.
Leamington.
Leeds.
Leicester, County.
Leicester, County Borough.
Lincoln, County:
  Holland.
  Lindsey.
Lincoln, County Borough.
Linlithgow, County.
Liverpool.
London, City.
London, County.
Louth.
Luton.
Macclesfield.
Manchester.
Margate.
Merioneth.
Middlesbrough.
Middlesex.
Montgomery, County.
Montrose.
Morley.
Nairn, Burgh.
Nairn, County.
Neath.
Newcastle-on-Tyne.
Newcastle-under-Lyme.
Newport (Monmouthshire).
Norfolk.
Northampton, County.
Northampton, County Borough.
Northumberland.
Norwich.
Nottingham, County.
Nottingham, County Borough.
Oban.
Oldham.
Oxford, County.
Oxford, County Borough.
Pembroke, County.
Penzance.
Perth, County.
Peterborough, Borough.
Peterborough, Soke of.
Plymouth.
Portsmouth.
Preston.
Reading.
Renfrew, County.
Rochdale.
Rochester.
Rotherham.
Rothesay.
Roxburgh, County.
Rutland, County.
St. Albans.
St. Helens.
Salford.
Salisbury.
Salop.
Selkirk, County.

LIST of Districts of Local Authorities from whom Inspectors' Annual Reports have been received since 2nd August 1894—*continued.*

Sheffield.
Somerset.
Southampton, County Borough.
Southport.
South Shields.
Stafford, Borough.
Stalybridge.
Stirling, Burgh.
Stockport.
Stockton-on-Tees.
Suffolk, East.
Suffolk, West.
Sunderland.
Surrey.
Sussex, West.
Sutherland.
Swansea.
Tiverton.
Truro.
Tynemouth.
Walsall.
Warwick, County.
Wenlock.
Westmorland.
Wigan.
Winchester.
Windsor.
Wolverhampton.
Worcester, County.
Worcester, County Borough.
Yarmouth.
York, County Borough.

APPENDIX, No. 5.

LIST of INSPECTORS of WEIGHTS and MEASURES who, since 2nd August 1894, have passed the Examination provided for by the 11th Section of the WEIGHTS AND MEASURES ACT, 1889.

Armstrong Michael John (Royal Irish Constabulary)	Ireland.
Bane, John J. (Royal Irish Constabulary)	ditto.
Barrington Richard (Royal Irish Constabulary)	ditto.
Bowley, Levi	Leicestershire.
Boyd, William (Royal Irish Constabulary)	Ireland.
Boyle, Bernard (Royal Irish Constabulary)	ditto.
Boyle, Joseph (Royal Irish Constabulary)	ditto.
Brennan, Daniel (Royal Irish Constabulary)	ditto.
Brennan, John (Royal Irish Constabulary)	ditto.
Carlos, Charles (Royal Irish Constabulary)	ditto.
Chambers, Michael (Royal Irish Constabulary)	ditto.
Chestnutt, John (Royal Irish Constabulary)	ditto.
Christopher, Michael John	Rathmines Township, Ireland.
Coalter, Robert (Royal Irish Constabulary)	Ireland.
Collins, Charles (Royal Irish Constabulary)	ditto.
Collins, Michael (Royal Irish Constabulary)	ditto.
Connolly, John (Royal Irish Constabulary)	ditto.
Connolly, Michael (Royal Irish Constabulary)	ditto.
Connolly, Thady (Royal Irish Constabulary)	ditto.
Conran, Edward Joseph (Royal Irish Constabulary)	ditto.
Conroy, Daniel (Royal Irish Constabulary)	ditto.
Cooper, Samuel	Liverpool.
Craughwell, Patrick (Royal Irish Constabulary)	Ireland.
Cronin, Francis (Royal Irish Constabulary)	ditto.
Cussen, James (Royal Irish Constabulary)	ditto.
Daly, Anthony (Royal Irish Constabulary)	ditto.
Davis, George William	West Bromwich.
Dawson, Walter	Sheffield.
Delaney, John Joseph (Royal Irish Constabulary)	Ireland.
Dennehy, Denis (Royal Irish Constabulary)	ditto.
Dobson, Thomas	Northumberland.
Doherty, Patrick (Royal Irish Constabulary)	Ireland.
Donohoe, Luke (Royal Irish Constabulary)	ditto.
Dunlop, William (Royal Irish Constabulary)	ditto.
Farrell, Thomas (Royal Irish Constabulary)	ditto.
Farry, Patrick (Royal Irish Constabulary)	ditto.
Fogarty, John (Royal Irish Constabulary)	ditto.
Gallagher, Edward (Royal Irish Constabulary)	ditto.
Gordon, William	Falkirk.
Hall, Frederick William Saint	Sheffield.
Hayden, Hubert (Royal Irish Constabulary)	Ireland.

Heggart, John Thomas (Royal Irish Constabulary)	Ireland.
Henshall, William	Manchester.
Holroyd, Gordon John	Nottingham.
Karr, Robert (Royal Irish Constabulary)	Ireland.
Kavanagh, James (Royal Irish Constabulary)	ditto.
Kyne, John (Royal Irish Constabulary)	ditto.
Leyden, James Arthur (Royal Irish Constabulary)	ditto.
Long, Richardson Alexander (Royal Irish Constabulary)	ditto.
Maher, John M. (Royal Irish Constabulary)	ditto.
Mallon, James (Royal Irish Constabulary)	ditto.
McCorry, James (Royal Irish Constabulary)	ditto.
McDonough, William G. (Royal Irish Constabulary)	ditto.
McElroy, James (Royal Irish Constabulary)	ditto.
McGoldrick, Michael (Royal Irish Constabulary)	ditto.
McHugh, Denis (Royal Irish Constabulary)	ditto.
McKay, James (Royal Irish Constabulary)	ditto.
McQueen, Edwin Robert (Royal Irish Constabulary)	ditto.
Metcalfe, James	Reigate.
Monaghan, James (Royal Irish Constabulary)	Ireland.
Morgan, Edward Conway	Glamorganshire.
Mullally, John (Royal Irish Constabulary)	Ireland.
Murphy, Daniel (Royal Irish Constabulary)	ditto.
Murphy, James (Royal Irish Constabulary)	ditto.
Murphy, John (Royal Irish Constabulary)	ditto.
Nelson, John Joseph (Royal Irish Constabulary)	ditto.
Nelson, William (Royal Irish Constabulary)	ditto.
Noble, William T. (Royal Irish Constabulary)	ditto.
O'Brien, John (Royal Irish Constabulary)	ditto.
O'Brien, Patrick (Royal Irish Constabulary)	ditto.
O'Gara, Patrick (Royal Irish Constabulary)	ditto.
O'Sullivan, Michael (Royal Irish Constabulary)	ditto.
Pentland, Thomas (Royal Irish Constabulary)	ditto.
Ryan, James (Royal Irish Constabulary)	ditto.
Sandles, Richard Garrett (Royal Irish Constabulary)	ditto.
Smith, Harry Craik	Isle of Wight.
Smyth, Nathaniel R. (Royal Irish Constabulary)	Ireland.
Starr, James (Royal Irish Constabulary)	ditto.
Sullivan, Daniel (Royal Irish Constabulary)	ditto.
Sullivan, Michael (Royal Irish Constabulary)	ditto.
Talty, Peter (Royal Irish Constabulary)	ditto.
Wallington, William Henry	Warrington.
Woods, John (Royal Irish Constabulary)	Ireland.

Appendix, No. 6.

LIST of Inspectors authorised by the Board of Trade to adjust Weights and Measures, in pursuance of the 12th Section of the Weights and Measures Act, 1889; since 2nd August 1894.

Name.	District.	Period of Authorisation.
Ball, A. E.	Worcester - - - - County -	30 June 1896.
Barham, J. W.	Louth - - - - Borough	31 December 1895.
Bolshaw, F. P.	Scarborough - - - Borough	Permanent.
Brown, T. C.	Dudley - - County Borough	31 December 1895.
Cameron, J.	Argyll - - - - County -	30 June 1895.
	Oban - - - - Burgh -	- ditto.
Christopher, M. J.	Rathmines and Rathgar - Township	Permanent.
Clark, W.	Renfrew - - - - County -	30 June 1896.
Clayton, W.	Clitheroe - - - - - Borough	31 December 1897.
Clowes, S.	Northampton - - - County -	31 December 1895.
Cox, H. P.	Berks - - - - County -	Permanent.
Crabtree, W. H. S.	Yorks (West Riding) - - County -	- ditto.
Critchley, D. C.	Worcester - - - - County -	30 June 1896.
Danby, J. W.	Burnley - - County Borough	- ditto.
Davis, G. W.	West Bromwich - County Borough	Permanent.
Dickson, R. A.	Peebles - - - - County -	31 August 1895.
Fox, W. F.	Southport - - - - Borough	31 December 1895.
Gordon, W.	Falkirk - - - - Burgh -	Permanent.
Henderson, J.	Dumbarton - - - Burgh -	31 December 1895.
Hutton, W.	York - - - County Borough	Permanent.
Jackson, J.	Burnley - - County Borough	30 April 1895.
Jeffrey, W.	Worcester - - - - County -	30 June 1896.
Jones, E.	Glamorgan - - - - County -	31 December 1895.
Jones, T.	Anglesey - - - - County -	- ditto.
Mair, J. B.	Elgin - - - - Burgh -	31 December 1895.
	Elgin - - - - County -	30 June 1896.
	Lossiemouth - - - Burgh -	31 December 1895.
McDonald, C. W.	Yorks (West Riding) - - County -	Permanent.
Mattinson, T.	Northampton - - - County -	31 December 1895.
Metcalfe, J.	Reigate - - - - Borough	31 May 1895.
Moir, C.	Berwick - - - - County -	30 June 1896.
Oliphant, J.	Montrose - - - - Burgh -	30 June 1895.
Pirie, J.	Rothes - - - - Burgh -	31 December 1895.
Porter, A.	Berwick - - - - County -	30 June 1896.
Pugh, A.	Worcester - - - - County -	- ditto.
Rutherford, A. H.	Leeds - - - County Borough	30 September 1895.
Scott, W.	Perth - - - - County -	- ditto.
Shaw, W.	Banff - - - - County -	Permanent.
Skelton, W.	Great Grimsby - County Borough	30 June 1895.
Slough, A. E.	Luton - - - - Borough	31 December 1895.
	St. Albans - - - - Borough	- ditto.
Smith, H. C.	Isle of Wight - - - County -	30 June 1895.
Speight, J.	Wakefield - - - - Borough	- ditto.
Thompson, M. A.	Berwick-on-Tweed - - Borough	31 December 1895.
Walters, H. C.	Suffolk, West - - - County -	30 April 1896.
Wasley, J.	Worcester - - - - County -	30 June 1896.
Wheeler, J.	Worcester - - - - County -	- ditto.

APPENDIX, No. 7.

(H. St. 3272.)

MEMORANDUM.

ADJUSTMENT of BRASS WEIGHTS.—Model Regulation, No. 26.

WITH the view of giving effect to Model Regulation No. 26, as adopted by local authorities, so far as relates to the adjustment of brass weights, it is now suggested that in districts where the inspectors are authorised by the Board of Trade to adjust weights and measures, such inspectors might acquaint manufacturers of weights and scale-makers, that after a date to be approved by the local authority who appoint the inspector, every new brass weight sent to the inspector for adjustment and verification should be provided with a counter-sunk or under-cut "adjusting-hole" for the purpose of adjustment and re-adjustment.

In any district where the inspector is provided with suitable drilling instruments, and himself drills a counter-sunk or under-cut hole in any brass weight submitted to him for adjustment, no such notification to manufacturers or scale-makers may be required.

It has been also brought to the notice of the Standards Office that sometimes where the adjusting plug is simply hammered into an ordinary cylindrical hole which is not counter-sunk or under-cut, and is not secured by a brass plug or cap, as required by Model Regulation No. 26, that then there is danger of the lead adjustment subsequently falling out.

It is desirable that uniform sizes of adjusting holes should be adopted on new brass weights, and the following sizes appear to meet the requirements of trade :—

Denomination of Brass Weight.		Diameter of Hole.	Depth of Hole.
Bell shape :	Lb.	Inch.	Inches.
	56	$1\frac{1}{8}$	$2\frac{1}{2}$
	28	$1\frac{1}{8}$	2
	14	$\frac{3}{4}$	$1\frac{1}{2}$
	7	$\frac{3}{4}$	$1\frac{1}{4}$
	4	$\frac{3}{4}$	1
	2	$\frac{1}{2}$	1
	1	$\frac{1}{2}$	1
	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$
	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$
Flat shape :	Lb.		
	7	$\frac{3}{4}$	Depends on the thickness and pattern of the weight.
	4	$\frac{3}{4}$	
	2	$\frac{3}{4}$	
	1	$\frac{1}{2}$	
	$\frac{1}{2}$	$\frac{1}{2}$	
	$\frac{1}{4}$	$\frac{1}{2}$	

Standards Office, Board of Trade,
1 January 1895.

APPENDIX, No. 8.

LIST of DISTRICTS of LOCAL AUTHORITIES who have sent Inspectors' Scale Beams for Examination by the BOARD OF TRADE since 2nd August 1894.

COUNTIES.

ENGLAND:

- Berks.
- Bucks.
- Chester.
- Derby.
- Devon.
- Dorset.
- Essex.
- Gloucester.
- Hants.
- Hertford.
- Kent.
- Leicester.
- London.
- Middlesex.
- Northumberland.
- Nottingham.
- Oxford.
- Salop.
- Somerset.
- Suffolk, East.
- Sussex, East.
- Yorks, West Riding.

WALES:

- Carnarvon.
- Denbigh.
- Radnor.

SCOTLAND:

- Berwick.
- Caithness.
- Kirkcudbright.
- Orkney.
- Roxburgh.
- Wigtown.

IRELAND:

- Clare.
- Cork, West Riding.
- Mayo.
- Westmeath.

LIST of Districts of Local Authorities who have sent Inspectors' Scale Beams, &c.—*continued.*

BOROUGHS AND BURGHS.

ENGLAND:

- Banbury.
- Bedford.
- Berwick-on-Tweed.
- Beverley.
- Birkenhead.
- Birmingham.
- Blackpool.
- Bootle.
- Bournemouth.
- Bradford.
- Bristol.
- Carlisle.
- Chesterfield.
- Coventry.
- Doncaster.
- Dudley.
- Durham.
- Exeter.
- Gravesend.
- Hanley.
- Huddersfield.
- Hull.
- Kendal.
- Liverpool.
- London.

ENGLAND—*continued.*

- Manchester.
- Newcastle-on-Tyne.
- Newport (Monmouthshire).
- Ossett.
- Plymouth.
- Preston.
- Rochdale.
- St. Albans.
- St. Helens.
- Scarborough.
- Southampton.
- Southport.
- South Shields.
- Truro.
- West Bromwich.
- Wolverhampton.
- Worcester.

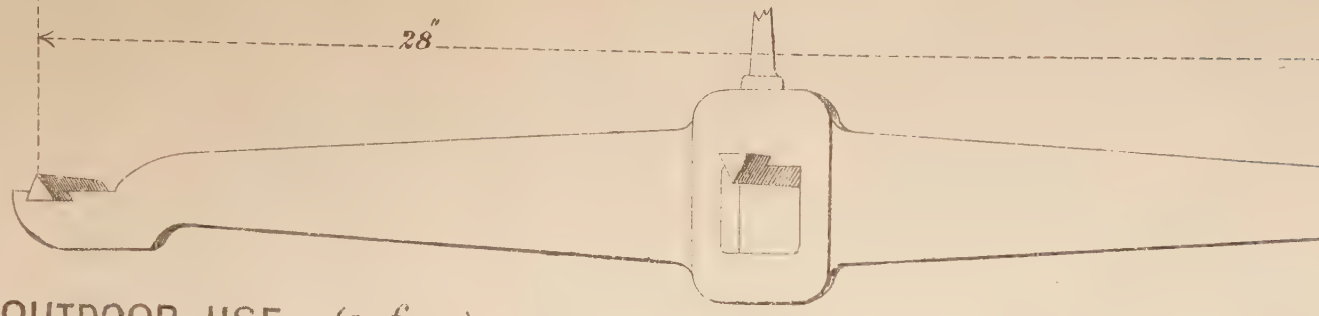
SCOTLAND:

- Dunfermline.
- Forfar.
- Greenock.
- Leith.

MODEL REGULATION Nº 23.

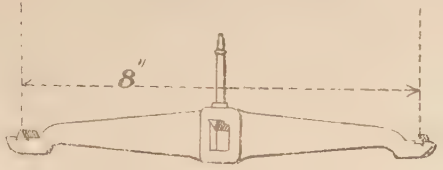
Inspectors' Scale-Beams as referred to in the Memorandum issued by the Stand
on 1st March, 1895.

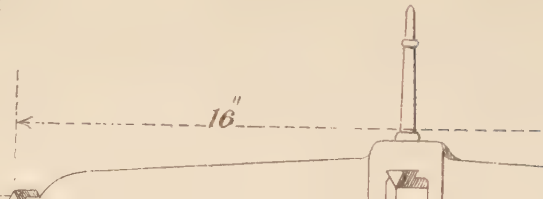
INDOOR USE *(a, b, c, d).*



a

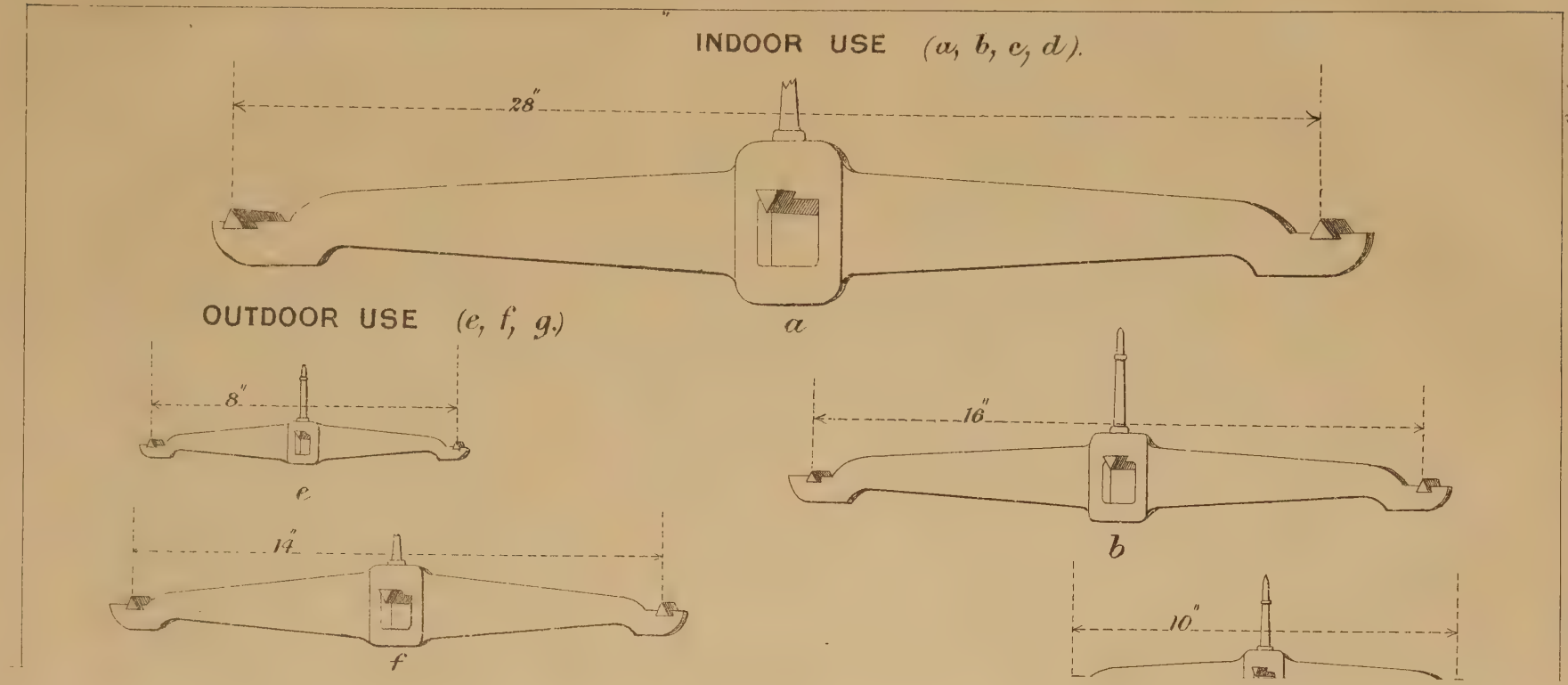
OUTDOOR USE *(e, f, g.)*





MODEL REGULATION N. 23.

Inspectors' Scale-Beams as referred to in the Memorandum issued by the Standards Department on 1st March, 1895.



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APPENDIX, No. 10.

MEMORANDUM.—NEW METRIC STANDARDS.

New Metric Standards.

Two new metric standards, of length and mass respectively (des prototypes nationaux), were delivered to the Board of Trade by the International Committee of Weights and Measures at Paris, on the 28th September 1889, and the third and final standard was received from the Committee in December last. All three standards are deposited at the Standards Office, 7, Old Palace Yard, Westminster, and are available for use in the verification of metric standards, or for the purpose of science or of manufacture. The two standards received in 1889 include a "line" standard metre measure (mètre-â-traits), and a kilogramme weight. The standard received last year is an "end" standard metre (mètre-â-bouts). It may be stated that these three standards, together with other similar standards supplied to 21 different States, are (*inter alia*) the outcome of the results of the labours of the International Committee for some years.

The standards were verified at the Bureau International des Poids et Mesures (Pavillon de Breteuil, Sèvres, près Paris), which bureau was established under a Metric Convention, dated 20th May 1875, signed by 20 different High Contracting States, exclusive of Great Britain, who, however, joined the Convention in September 1884. The Committee is founded and maintained by common contribution from all countries who are parties to the Convention of 1875. The bureau of the Committee is required to be near Paris, and has been declared to be internationally neuter. The Committee was charged in 1875 with the construction, restoration, and verification of new metric standards (des prototypes internationaux) to replace the ancient standards of France (mètre et kilogramme *des archives*), and with the verification of copies of the new standards for all the contracting States. By such means the international accuracy of metric standards is now assured throughout the world.

The Committee which undertakes also the verification of standards for scientific authorities or persons includes the following members:—

Professor Foerster, Berlin, President.
Dr. Hirsch, Neuchâtel, Secretary.

MEMBERS:

Professor Arndtsen, Christiania.
M. J. Bertrand, Paris.
M. L. de Bodola, Budapest.
Professor Brioschi, Milan.
Mr. H. J. Chaney, London.
Dr. B. A. Gould, Cambridge (Mass.).
Dr. S. C. Hépitès, Bucharest.
Professor Victor von Lang, Vienna.
M. Henry de Macedo, Madrid.
Professor Thalèn, Upsala.
Dr. Wild, St. Petersburgh.

The Mètre.

The two metric standards above referred to are made of iridio-platinum, or an alloy of 90 per cent. of platinum and 10 per cent. of iridium. The mètres are in transverse section, nearly of the form of the letter X, known as the Tresca form, and iridio-platinum, although a costly metal, was selected as being less affected by heat, practically non-oxidizable, and well adapted for receiving finely engraved lines. This alloy appears, indeed, to be of all substances the least likely to be affected by time or circumstance, and has been preferred for standards purposes to rock-crystal, gold, &c. The lines on the mètre-â-traits are fine, being barely visible to the naked eye.

The iridio-platinum bars were constructed by Messrs. Johnson and Matthey, of London, and were finished by Messrs. Brunner, M. Collot, and M. Laurent, of Paris. The lines on the metre were traced by M. G. Tresca, at the Conservatoire des Arts et Mètiers, Paris.

The chemical tests of the alloys were made by Professor Stas, and by MM. H. St. Claire-Deville, Debray, and Tornöe. The actual comparisons of the standards were made by Dr. Benoît, with the assistance of Dr. Chappuis, Dr. Guillaume, and M. Thiesen. The dilatation of the bars has been experimentally determined at Paris by M. Fizeau and Dr. Benoît.

The actual relation of our prototype metre No. 16 is as follows:—
At 0 Centigrade.

$$\text{No. 16} = 1 \text{ metre} - 0{\cdot}6^{\mu} \pm 0{\cdot}1^{\mu}.$$

Here μ means one *micron*, or one-thousandth of a millimetre (or nearly 0·00004 inch), so that mètre 16 may be said to have been verified with an accuracy of one part in a million.

The certificate of the verification of the end standard, or mètre-â-bout (étalon No. 6), will not be issued by the Committee until their general conference in September next; but this standard has been verified also with great accuracy, with a probable error of $\pm 0{\cdot}3\,\mu$. In the verification of the end standard (mètre-â-bouts) MM. Cornu and Benoît have introduced a method of reflection, by means of which it is unnecessary to bring the ends of the metre bar into contact with any touching surfaces, and thus the measuring ends of the bar may be carefully preserved and used. Only Austro-Hungary, Germany, Great Britain, ana Russia have at present applied to the International Committee to be supplied with *end* standard mètres.

Experiments with reference to light-wave analysis, which have been carried out under the directions of the International Committee by Dr. Michelson during 1893, with the view to the discovery of a radiation of light of sufficient homogeneity to serve as an ultimate standard of length, appear to show that it is possible within certain limits to reproduce the length of the mètre by reference to such physical constant.

In the verification of standards the measurement of temperature is of importance, and therefore with every national mètre there is issued by the Committee two standard centigrade thermometers, constructed by M. Tonnelot, and verified at the bureau in relation to the hydrogen thermometer. Copies of the two certificates of verification recently issued with the thermometers delivered to Great Britain are appended to this Memorandum (4306 and 4305).

The Kilogramme.

The unit of mass, the kilogramme, is determined by a piece of iridio-platinum in the form of a cylinder, the height and diameter of which equal 39 millimetres. The kilogramme No. 18, supplied to Great Britain, has no engraved distinguishing mark, and is highly polished. On analysis it showed very faint traces of ruthenium, rhodium, and iron. Its volume was found to be at 0 Centigrade :—

millilitres.

18 = 46·414.

corresponding to a density of—

21·5454.

After its final adjustment it was found to be in vacuô at 0° Centigrade :—

kg. milligramme.

Prototype 18 = 1 + 0·070 ± 0·002

So that it may be said that the kilogramme (kg.) has been verified with a probable accuracy of 0·002 parts in a million.

Standards Office, Board of Trade,
21 February 1895.

BUREAU INTERNATIONAL DES POIDS ET MESURES.

Pavillon de Breteuil, Sèvres (S.-et-O.)

CERTIFICAT

du THERMOMÈTRE TONNELOT, N° 4306, destiné au Gouvernment du Royaume-Uni de Grande-Bretagne et d'Irlande.

DESCRIPTION.

Le thermomètre a été construit au mois de Mai 1884, par M. Tonnelot, constructeur d'instruments météorologiques de précision, à Paris.

Le thermomètre est en verre dur, dont l'analyse est donnée dans l'annexe V à ce certificat; le réservoir est soudé, et sensiblement du même diamètre extérieur que la tige.

La division de l'échelle est équidistante, en dixièmes de degré, de — 3°6 à 51°5, et de 95°0 à 103°5; la partie intermédiaire de l'échelle est remplacée par une ampoule.

Les dimensions caractéristiques sont, en millimètres :

	mm.
Distance du milieu du réservoir au zéro de l'échelle - - -	60·0
Distance du milieu du réservoir au point 100 - - - -	462·3
Longueur d'un degré de l'échelle - - - - - -	6·942
Longueur totale du thermomètre - - - - - -	535·5
Diamètre extérieur de la tige et du réservoir - - - -	5·0

ÉTUDE.

Division.—L'étude de la division a été faite en pointant successivement chaque trait du thermomètre au moyen d'un microscope porté sur le chariot d'une machine à diviser; cette étude a été exécutée deux fois pour deux positions symétriques et inverses du thermomètre. L'équidistance des traits a été trouvée satisfaisante.

Calibrage.—On a fait d'abord un calibrage en 2 parties, par 3 colonnes de 50 degrés, observées 10 fois dans chaque position; puis une division en 5 parties de la section [0·50], par 3 calibrages complets, calculés séparément; enfin, un calibrage complet de 2 en 2 degrés de chaque section de 10 degrés, prolongée de 2 degrés de part et d'autre (donc de — 2° à + 12°, de + 8° à + 22°, et ainsi de suite). Les corrections de calibre des points voisins de 100° ont été déterminées par quatre colonnes de mercure supplémentaires de longueurs différentes.

Les corrections de calibre, rapportées au système [0·100], sont les suivantes:

CORRECTIONS DE CALIBRE.

DIVISIONS.	CORRECTIONS.	DIVISIONS.	CORRECTIONS.	DIVISIONS.	CORRECTIONS.
	°		°		°
— 2	+ 0·0125	20	— 0·1431	42	— 0·1604
0	0·0000	22	— 0·1567	44	— 0·1377
+ 2	— 0·0124	24	— 0·1714	46	— 0·1123
4	— 0·0261	26	— 0·1871	48	— 0·0734
6	— 0·0346	28	— 0·2041	50	— 0·0270
8	— 0·0430	30	— 0·2145	52	— 0·....
10	— 0·0656	32	— 0·2156		
12	— 0·0843	34	— 0·2082	96	— 0·1504
14	— 0·1003	36	— 0·1990	98	— 0·0776
16	— 0·1143	38	— 0·1869	100	0·0000
18	— 0·1282	40	— 0·1754	102	+ 0·0766

L'erreur probable de ces corrections ne dépasse pas $\pm$ 0°·001.

Une table complète des corrections de calibre pour tous les dixièmes de degré en a été déduite par interpolation graphique.

L'étude de la division et le calibrage ont été faits en Novembre 1884 par Me M. Wagner sous la direction de M. le Dr R. Benoît, Premier adjoint au Bureau International des Poids et Mesures.

Coefficients de pression.—Le coefficient de pression extérieure, β_e, a été détermine par une série de 81 observations, avec des pressions variant entre 730mm·4 et 716mm·0 de hauteur de mercure.

Le coefficient de pression intérieure, β_i, a été calculé par la relation:

$$\beta_i = \beta_e + 0{\cdot}0000154.$$

Cette étude a été faite par M. le Dr Ch.-Ed. Guillaume, le 18 Décembre 1884.

Les coefficients de pression sont les suivants:

$$\beta_e = 0{\cdot}0001181 \pm 0{\cdot}00000024.$$
$$\beta_i = 0{\cdot}0001335 \pm 0{\cdot}00000024.$$

Ces nombres expriment, en degrés, la variation de la lecture pour une variation de la pression mercurielle d'un millimètre.

Intervalle fondamental.—L'intervalle fondamental a été déterminé 5 fois. Les observations du point 100 ont été faites chaque fois dans la position horizontale et dans la position verticale, le point zéro étant déterminé chaque fois, en position verticale, immédiatement après le point 100. Les observations ont toutes été réduites à la position horizontale à l'aide des corrections de pression.

Les résultats des observations sont donnés dans le tableau suivant :

Dates.	Observateur.	Intervalle Fondamental.
		div.
2 Mars 1885 - -	M. Guillaume - - - - - -	100·087
25 Mars 1885 - -	- id - - - - - - -	100·099
14 Avril 1885 - -	- - id - - - - - - -	100·101
21 Avril 1885 - -	- - id - - - - - - -	100·092
11 Mai 1885 - -	- - id - - - - - - -	100·091
	Valeur moyenne	100·0949
		±0·0017

On en déduit la valeur d'une division : 0°·999060. ±0°·000017.

Zéro.—L'étude du thermomètre étant terminée, le point zéro a été déterminé par M. le Dr Ch.-Ed. Guillaume, 3 fois ; les résultats de ces observations sont les suivants :

Dates des Observations.	Température antérieure à l'observation du zéro.	Lecture du zéro corrigée.	Zéro ramené à une exposition prolongée à la température de la glace fondante.
	°		
2 Avril 1887 - - - - -	8 0	—0·090	—0·083
21 Septembre 1887 - - -	16·0	—0·093	—0·079
29 Juin 1888 - - - - -	16·8	—0·092	—0·077

Réduction à l'échelle normale.—Le tableau des corrections servant à réduire la température exprimée en degrés du thermomètre à mercure Tonnelot, No. 4306 en degrés de l'échelle normale, adoptée pour le Service International des Poids et Mesures se trouve dans l'Annexe V. de ce certificat.

Annexes :

I.—Table des corrections de calibre pour tous les dixièmes de degré de—2°, à+50°, et de 96° à 102°.

II.—Table des corrections de pression intérieure pour tous les degrés.

III.—Table des corrections de pression extérieure pour tous les millimètres, de 700mm à 819mm de pression mercurielle.

IV.—Table des corrections d'intervalle fondamental pour tous les degrés.

V.—Notice sur la composition chimique du verre des thermomètres Tonnelot, et sur l'emploi des tables de correction, contenant encore :

1° La table des dépressions du zéro dans les thermomètres en verre dur.

2° La table des corrections à ajouter aux lectures du thermomètre, corrigées au moyen des tables I. à IV., afin de rapporter les températures à l'échelle normale adoptée pour le Service international des Poids et Mesures.

CERTIFICAT

du THERMOMÈTRE TONNELOT, No. 4305, destiné au Gouvernement du Royaume-Uni, de Grande-Bretagne et d'Irlande.

DESCRIPTION.

Le thermomètre a été construit au mois de Mai 1884, par M. Tonnelot, constructeur d'instruments météorologiques de précision, à Paris.

Le thermomètre est en verre dur, dont l'analyse est donnée dans l'annexe V. à ce certificat; le réservoir est soudé, et sensiblement du même diamètre extérieur que la tige.

La division de l'échelle est équidistante, en dixièmes de degré, de — 3°·2 à 51°·3, et de 95°·0 à 103°·6; la partie intermédiaire de l'échelle est remplacée par une ampoule.

Les dimensions caractéristiques sont, en millimètres :

	mm.
Distance du milieu du réservoir au zéro de l'échelle - -	55·0
Distance du milieu du réservoir au point 100 - - -	456·7
Longueur d'un degré de l'échelle - - - - -	6·972
Longueur totale du thermomètre - - - - -	529·0
Diamètre extérieur de la tige et du réservoir - - -	4·8

ÉTUDE.

Division.—L'étude de la division a été faite en pointant successivement chaque trait du thermomètre au moyen d'un microscope porté sur le chariot d'une machine à diviser; cette étude a été exécutée deux fois pour deux positions symétriques et inverses du thermomètre. L'équidistance des traits a été trouvée satisfaisante.

Calibrage.—On a fait d'abord un calibrage en 2 parties, par 3 colonnes de 50 degrés, observées 10 fois dans chaque position; puis une division en 5 parties de la section [0·50], par 3 calibrages complets, calculés séparément; enfin, un calibrage complet de 2 en 2 degrés de chaque section de 10 degrés, prolongée de 2 degrés de part et d'autre (donc de —2° à +12°, de +8° à +22°, et ainsi de suite). Les corrections de calibre des points voisins de 100° ont été déterminées par quatre colonnes de mercure supplémentaires de longueurs différentes.

Les corrections de calibre, rapportées au système [0·100], sont les suivantes :

CORRECTIONS DE CALIBRE.

DIVISIONS.	CORRECTIONS.	DIVISIONS.	CORRECTIONS.	DIVISIONS.	CORRECTIONS.
	°		°		°
— 2	+ 0·0227	20	— 0·0936	42	+ 0·0654
0	± 0·0000	22	— 0·0980	44	0·0586
+ 2	— 0·0268	24	— 0·0959	46	+ 0·0493
4	— 0·0433	26	— 0·0913	48	+ 0·0271
6	— 0·0574	28	— 0·0813	50	— 0·0033
8	— 0·0687	30	— 0·0572	52	— 0·...
10	— 0·0728	32	— 0·0285		
12	— 0·0755	34	+ 0·0018	96	+ 0·0592
14	— 0·0824	36	+ 0·0300	98	+ 0·0323
16	— 0·0873	38	+ 0·0503	100	0·0000
18	— 0·0898	40	+ 0·0633	102	— 0·0366

L'erreur probable de ces corrections ne dépasse pas ± 0°·001.

Une table complète des corrections de calibre pour tous les dixièmes de degré en a été déduite par interpolation graphique.

L'étude de la division et le calibrage ont été faits en Novembre 1884 par M^elle^ A. Taufflieb sous la direction de M. le D^r^ R. Benoît, Premier adjoint au Bureau International des Poids et Mesures.

Coefficients de pression.—Le coefficient de pression extérieure, β_e, a été déterminé par une série de 81 observations, avec des pressions variant entre 728^mm·4^ et 713^mm·5^ de hauteur de mercure.

Le coefficient de pression intérieure, β_i, a été calculé par la relation :

$$\beta_i = \beta_e + 0{\cdot}0000454.$$

Cette étude a été faite par M. le D^r^ Ch.-Ed. Guillaume, le 18 Décembre 1884.

Les coefficients de pression sont les suivants :

$$\beta_e = 0{\cdot}0001069 \pm 0{\cdot}00000028$$
$$\beta_i = 0{\cdot}0001223 \pm 0{\cdot}00000028$$

Ces nombres expriment, en degrés, la variation de la lecture pour une variation de la pression mercurielle d'un millimètre.

Intervalle fondamental.—L'intervalle fondamental a été déterminé 5 fois. Les observations du point 100 ont été faites chaque fois dans la position horizontale et dans la position verticale, le point zéro étant déterminé chaque fois, en position verticale, immédiatement après le point 100. Les observations ont toutes été réduites à la position horizontale à l'aide des corrections de pression.

Les résultats des observations sont donnés dans le tableau suivant :

Dates.	Observateur.	Intervalle Fondamental.
		div.
2 Mars 1885	M. Guillaume	100·089
25 Mars 1885	id	100·097
14 Avril 1885	id	100·096
20 Avril 1885	id	100·095
11 Mai 1885	id	100·096
	Valeur moyenne	100·0946
		±0·0010

On en déduit la valeur d'une division : 0°·999054 ± 0°·000010.

Zéro.—L'étude du thermomètre étant terminée, le point zéro a été déterminé par M. le D^r^ Ch.-Ed. Guillaume, 3 fois ; les résultats de ces observations sont les suivants :

Dates des Observations.	Température antérieure à l'observation du zéro.	Lecture du zéro corrigée.	Zéro ramené à une exposition prolongée à la température de la glace fondante.
	°		
1 Avril 1887	8·0	—0·071	—0·064
21 Septembre 1887	16·0	—0·079	—0·035
29 Juin 1888	16·8	—0·077	—0·062

Réduction à l'échelle normale.—Le tableau des corrections servant à réduire la température exprimée en degrés du thermomètre à mercure Tonnelot, No. 4305 en degrés de l'échelle normale, adoptée pour le Service International des Poids et Mesures se trouve dans l'Annexe V. de ce certificat.

Le thermomètre No. 4305 a été comparé dans le voisinage de 20°, 40°, avec le thermomètre de même forme No. 4330, temoin de l'échelle normale du Service International. On a trouvé :

à 20°·150, No. 4305=No. 4330±0°·000
à 40·075, No. 4305=No. 4330+0·001

ANNEXES :

I.—Table des corrections de calibre pour tous les dixièmes de degré de—2°, à + 50°, et de 96° à 102°.

II.—Table des corrections de pression intérieure pour tous les degrés.

III.—Table des corrections de pression extérieure pour tous les millimètres, de 700mm à 819mm de pression mercurielle.

IV.—Table des corrections d'intervalle fondamental pour tous les degrés.

V.—Notice sur la composition chimique du verre des thermomètres Tonnelot, et sur l'emploi des tables de correction, contenant encore :

1° La table des dépressions du zéro dans les thermomètres en verre dur.
2° La table des corrections à ajouter aux lectures du thermomètre, corrigées au moyen des tables I. à IV., afin de rapporter les températures à l'échelle normale adoptée pour le Service international des Poids et Mesures.

Appendix, No. 11.

REPORT on the Re-comparison of the Parliamentary Copy, P. C. VI., with the Imperial Yard No. 1.

The Parliamentary Copy, P. C. VI., was originally verified in 1886, as reported in the Report of the Board of Trade for that year, and it was legalised as a standard measure of the yard by Her Majesty's Order in Council of 3rd August 1886. Its actual length was then found to be 35·9999966 inches, and its linear coefficient of expansion was found to be 0·000009696 for 1° Fahrenheit. In 1892, in consequence of doubt as to some molecular change in this bar, it was then re-compared with the Imperial Standard, with the following result :—

Observer (1892)	Inch.
S. F. Read.	P. C. VI. = No. 1.—0·0001184
Corporal Amos.	P. C. VI. = No. 1.—0·0001149
	or P. C. VI. = No. 1.—0·0001166
	± 0·0000011 inch.

For the purpose of determining the equivalent length of the yard in terms of the metre, the standard P. C. VI. has now been more carefully re-compared with No. 1, with the following results :—

Result of the Comparison of Yard, P. C. VI., with the Imperial Yard, No. 1.

Mr. Chaney.

Date. 1894.	Result. Inch.	Δ = Difference from Mean.	$10^8 \times \Delta^2$.
November 19	— 0·0002076	— 0·0000719	0·516961
,, 20	— 0·0001492	— 0·0000135	0·018225
,, 22	— 0·0001247	+ 0·0000110	0·012100
,, 23	— 0·0000853	+ 0·0000504	0·254016
,, 26	— 0·0001118	+ 0·0000239	0·057121
Mean =	— 0·0001357		0·858423

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma \Delta^2}{n(n-1)}}$$

$\Sigma \Delta^2 = 10^{-8} \times 0{\cdot}858423$, $n = 5$;

$\therefore$ Probable error $= \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}042921}$

$= \pm 0{\cdot}0000140$

Mr. Blumbach.

November 22	— 0·0001408	+ 0·0000009	0·000081
,, 22	— 0·0001234	+ 0 0000183	0·033489
,, 23	— 0·0001556	— 0·0000139	0·019321
,, 23	— 0·0001615	— 0·0000198	0·039204
,, 23	— 0·0001304	+ 0 0000113	0·012769
,, 26	— 0·0001389	+ 0·0000028	0·000784
,, 26	— 0·0001416	+ 0·0000001	0·000001
Mean =	— 0·0001417		0·105649

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma \Delta^2}{n(n-1)}}$$

$\Sigma \Delta^2 = 10^{-8} \times 0{\cdot}105649$, $n = 7$;

$\therefore$ Probable error $= \cdot 6745 \times 10^{-1} \times \sqrt{0{\cdot}002515}$

$= \pm 0{\cdot}0000034$

S. F. READ.

Date 1894.	Result. Inch.	Δ = Difference from Mean.	$10^8 \times \Delta^2$
November 19	— 0·0001264	+ 0 0000047	0·002209
„ 20	— 0·0001560	— 0·0000249	0·062001
„ 21	— 0·0001466	— 0·0000155	0·024025
„ 23	— 0·0001351	— 0·0000040	0·001600
„ 26	— 0·0000914	+ 0·0000397	0·157609
Mean =	— 0·0001311		0·247444

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma \Delta^2}{n(n-1)}}$$

$\Sigma \Delta^2 = 10^{-8} \times 0{\cdot}247444$, $n = 5$;

$\therefore$ Probable error $= \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}012372}$
$= \pm 0{\cdot}0000075$

W. STANSFIELD.

November 20	— 0·0001685	— 0·0000075	0·005625
„ 23	— 0·0002130	— 0·0000520	0·270400
„ 23	— 0·0001973	— 0·0000363	0·131769
„ 24	— 0·0001647	— 0·0000037	0·001369
„ 24	— 0·0001237	+ 0·0000373	0·139129
„ 24	— 0·0001497	+ 0·0000113	0·012769
„ 24	— 0·0001493	+ 0·0000117	0·013689
„ 26	— 0·0001219	+ 0·0000391	0·152881
Mean =	— 0·0001610		0·727631

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma \Delta^2}{n(n-1)}}$$

$\Sigma \Delta^2 = 10^{-8} \times 0{\cdot}727631$, $n = 8$;

$\therefore$ Probable error $= \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}012993}$
$= \pm 0{\cdot}0000077$

COMBINATION OF OBSERVATIONS.

Observer.	R = Result.	p = Weight.	Δ = Difference from Mean.	$10^8 \times \Delta^2$
Mr. Chaney	— 0·0001357	23	+ 0·0000068	0·004624
Mr. Blumbach	— 0·0001417	397	+ 0·0000008	0·000064
S. F. Read	— 0·0001311	81	+ 0·0000114	0·012996
W. Stansfield	— 0·0001610	77	— 0·0000185	0·034225
Mean $\frac{\Sigma p R}{\Sigma p}$ =	— 0·0001425	578		

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma p \Delta^2}{(n-1)\Sigma p}}$$

$\Sigma p \Delta^2 = 10^{-8} \times 3{\cdot}819761$, $\Sigma p = 578$, $n = 4$;

$\therefore$ Probable error $= \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}002203}$
$= \pm 0{\cdot}0000032$

Thus the final result is—

Yard. Yard. Inch.
P. C. VI. = No. 1 — 0·0001425,

Inch.
with probable error ± 0·0000032

The precise length, therefore, of the yard delivered to Dr. Benoit by Mr. Garnham Roper, on 14th December last, is 35·9998575 inches. A copy of the numerous comparisons from which the above results of 1894 were obtained will be forwarded in due course to the Director of the Bureau International des Poids et Mesures. It may be stated that P. C. VI. is identical in form with No. 1, and is made of similar bronze alloy.

After the comparisons of the metre and yard are completed at the Bureau, a final series of comparisons may be made in London of P. C. VI. and No. 1. It has been shewn in the Report of the Board of Trade for the year 1892, that by comparison with the standard yard measures deposited with the Royal Society at the Royal Mint and at the Royal Observatory, no appreciable change was found in 1892 in the length of No. 1, since its original verification in 1857.

REPORT on the RE-COMPARISON of the SUPPLEMENTARY STANDARD YARD No. 12, with No. VI.

The Yard, No. 12, is one of the series constructed under the directions of the Standards Commission as reported in 1858 in Mr. Airy's account of the construction of the new National Standard, and it remained at the Royal Observatory until 1870, when it was transferred to the Standards Department. It has been but little used since 1858, when its length was reported to be 36·0000682 inches, as deduced from a rate of thermometric expansion equivalent to 0·000341 inch for one degree Fahrenheit; the standard temperature of No. 12 being stated by Mr. Airy as 61°·80.

The yard has now for the first time been compared with No. VI., and the results of the comparison have been calculated as follows:—

RESULTS of Comparison of Yard P. C. VI., with Yard No. 12.

Mr. CHANEY.

Date. 1894.	Result. Inch.	Δ = Difference from Mean.	$10^3 \times \Delta^2$
November 30	— 0·0002597	+ 0·0000221	0·048841
* December 1	— 0·0002383 (5 readings only)	+ 0·0000435	0·189225
,, 3	— 0·0002899	— 0·0000081	0·006561
,, 4	— 0·0003177	— 0·0000359	0·128881
Mean =	— 0·0002818		

* The weight of this observation is $\frac{1}{2}$ that of each of the others.

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma\, p\, \Delta^2}{(n-1)\, \Sigma\, p}}$$

$\Sigma\, p = 3\frac{1}{2}$, $\quad \Sigma\, p\, \Delta^2 = 10^{-8} \times 0{\cdot}278895$, $n = 4$;

$\therefore$ Probable error $= \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}026561}$

$= \pm\, 0{\cdot}0000110$

Mr. BLUMBACH.

November	26	— 0·0002006	+ 0·0000737	0·543169
,,	27	— 0·0002599	+ 0·0000144	0·020736
,,	29	— 0·0002447	+ 0·0000296	0·087616
,,	30	— 0·0002285	+ 0·0000458	0·209764
December	4	— 0·0003372	— 0·0000629	0·395641
,,	4	— 0·0003235	— 0·0000492	0·242064
,,	5	— 0·0003524	— 0·0000781	0·609961
,,	5	— 0·0003027	— 0·0000284	0·080656
,,	6	— 0·0002485	+ 0·0000258	0·066564
,,	6	— 0·0002856	— 0·0000113	0·012769
,,	7	— 0·0002508	+ 0·0000235	0·055225
,,	7	— 0·0002566	+ 0·0000177	0·031329
Mean =		— 0·0002743		2·355494

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma\, \Delta^2}{n\,(n-1)}}$$

$10^8 \times \Sigma\, \Delta^2 = 2{\cdot}355494$, $n = 12$;

$\therefore$ Probable error $= \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}017845}$

$= \pm\, 0{\cdot}0000090$

S. F. READ.

Date. 1894.	Result. Inch.	Δ = Difference from Mean.	$10^8 \times \Delta^2$
November 27	— 0·0003049	— 0·0000443	0·196249
„ 27	— 0·0002124	+ 0·0000482	0·232324
„ 29	— 0·0003094	— 0·0000488	0·238144
„ 30	— 0·0003082	— 0·0000476	0·226576
December 3	— 0·0002389	+ 0·0000217	0·047089
* „ 4	— 0·0002780 (5 readings only)	— 0·0000174	0·030276
„ 5	— 0·0002175	+ 0·0000431	0·185761
„ 7	— 0·0002244	+ 0·0000362	0·131044
Mean =	— 0·0002606		

* The weight of this observation is ½ that of each of the others.

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma\, p\, \Delta^2}{(n-1)\,\Sigma\, p}}$$

$$\Sigma\, p = 7\tfrac{1}{2}, \quad \Sigma\, p\, \Delta^2 = 10^{-8} \times 1{\cdot}272325, \quad n = 8;$$

$$\therefore \text{Probable error} = \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}024235}$$
$$= \pm\, 0{\cdot}0000105$$

W. STANSFIELD.

November 26	— 0·0002652	— 0·0000056	0·003136
„ 26	— 0·0002509	+ 0·0000087	0·007569
„ 29	— 0·0002584	+ 0·0000012	0·000144
„ 30	— 0·0002663	— 0·0000067	0·004489
December 3	— 0·0002379	+ 0·0000217	0·047089
„ 4	— 0·0002522	+ 0·0000074	0·005476
„ 5	— 0·0003811	— 0·0001215	1·476225
„ 5	— 0·0002728	— 0·0000132	0·017424
„ 6	— 0·0002518	+ 0·0000078	0·006084
„ 6	— 0·0002082	+ 0·0000514	0·264196
„ 7	— 0·0002344	+ 0·0000252	0·063504
„ 7	— 0·0002363	+ 0·0000233	0·054289
Mean =	— 0·0002596		1·949625

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma\, \Delta^2}{n\,(n-1)}}$$

$$10^8 \times \Sigma\, \Delta^2 = 1{\cdot}949625, \quad n = 12;$$

$$\therefore \text{Probable error} = \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}014770}$$
$$= \pm\, 0{\cdot}0000082$$

Combination of Observations.

Observer.	R = Result.	p = Weight.	Δ = Difference from Mean.	$10^3 \times \Delta^2$
Mr. Chaney	— 0·0002818	38	— 0·0000138	0·019044
Mr. Blumbach	— 0·0002743	56	— 0·0000063	0·003969
S. F. Read	— 0·0002606	41	+ 0·0000074	0·005476
W. Stansfield	— 0·0002596	68	+ 0·0000084	0·007056
Mean $\frac{\Sigma\, p\, R}{\Sigma\, p}$ =	— 0·0002680	203		

$$\text{Probable error} = \cdot 6745 \times \sqrt{\frac{\Sigma\, p\, \Delta^2}{(n-1)\,\Sigma\, p}}$$

$$\Sigma\, p = 203, \qquad \Sigma\, p\, \Delta^2 = 10^{-8} \times 1{\cdot}650260, \qquad n = 4;$$

$$\therefore \text{Probable error} = \cdot 6745 \times 10^{-4} \times \sqrt{0{\cdot}002710}$$
$$= \pm\, 0{\cdot}0000035$$

Thus the final result is:—

Inch.

P. C. VI. = No. 12 — 0·0002680,

with probable error ± 0·0000035

On the return of P. C. VI. to London, a further series of comparisons may be made of No. 12 with No. VI., as well as with No. 1. The standard No. 12 is identical in form with No. VI., and is made of similar bronze alloy. It is packed in a box prepared for it by the Standards Commission.

Standards Office,
7 January 1895.

APPENDIX, No. 12.

MEMORANDUM on the Capacity of a *Tun* of Water.

THE decision of the Standards Department has been asked by two official authorities on the question as to what was the true capacity of a *tun* of water on the 3rd June 1824. A local authority agreed for a consideration to supply certain ships with 400 tuns of water each day, and as on 3rd June 1824 there were in use three different gallon measures on which the tun might be based, it became doubtful as to how many imperial gallons of the present day the local authority were bound to deliver.

The three different gallon measures in use were :—

	Cubic inches.
A Winchester corn gallon	= $272\frac{1}{4}$
A wine gallon	= 231
An ale gallon	= 282

Three such separate gallon measures had been in use from ancient times (two of them probably from 1225) until 1824; when by the passing of the Weights and Measures Act, 5 Geo. 4, c. 74 (17th June 1824), the present imperial gallon containing 277·274 cubic inches was introduced, and the use of the three ancient gallon measures was made illegal. The new imperial gallon did not, however, come into legal use until 1st May 1825, and, therefore, no contracts by it could have been compulsory in June 1824.

The gallon measure referred to in the expression "tun" appears to have been the wine gallon, as the tun since 1423 (Act 2 Hen. 6) had been declared to contain 252 wine gallons, and the use of such "tun" became general for shipping and customs purposes. The expression *tun* appears to have been derived from the old French shipping term *tonne*, and was often found to be used in place of the *ton* or weight of 2,240 pounds. Thus, a tun of timber was a measure of 40 solid feet cut to the square (Act 12 Charles 2, c. 14); a tun of coals was 20 cwt. (Act 9 & 10 Will. 3, c. 13); a tun of oil (Trinity House measurement) was 252 gallons. The tun of ale contained 216 gallons, and it appears to have been a customary measure confined to the measurement of ale and beer, and not to have been legalised in the same manner as the wine gallon, or to have been used for shipping or navigation purposes.

No reference appears to be made in any statutes or official reports as to the capacity or weight of a tun of water, and we can only assume that the tun of water referred to was the tun generally used for shipping, customs, and navigation purposes.

The contract on 3rd June 1824 would, therefore, have been by the tun of 252 wine gallons. As each wine gallon contained 8·33 avoirdupois pounds, as compared with 10 pounds contained in the present imperial gallon, it would appear to follow that the contract to deliver daily 400 tuns of water would be fulfilled by the delivery of 210 imperial gallons to the tun (or 209·916 gallons), equivalent to 252 of the old wine gallons in use on 3rd June 1824. By the use of the present imperial ton of 224 gallons, or of 2,240 pounds weight, any uncertainty as to the capacity of a "tun" would, of course, be avoided.

Standards Office,
5 April 1895.

WEIGHTS AND MEASURES.

REPORT by the BOARD OF TRADE on their PROCEEDINGS and BUSINESS under the WEIGHTS AND MEASURES ACTS, 1878 and 1889.

(*Presented pursuant to Act of Parliament.*)

Ordered, by The House of Commons, *to be Printed,*
26 *August* 1895.

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